ANIMAL MIND

FRANCES PITT

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ANIMAL MIND

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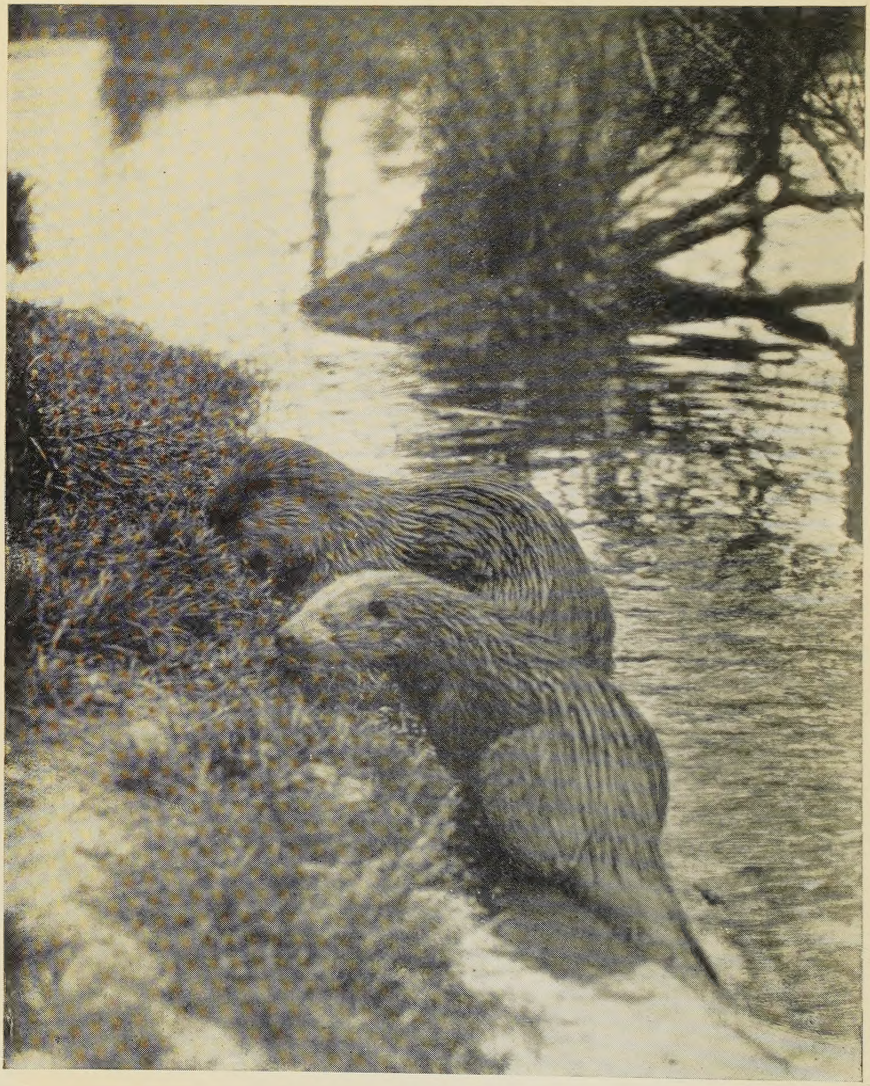

TOM AND MOSES

ANIMAL MIND

BY

FRANCES PITT

LONDON
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PREFACE

THIS book is not a dissertation on psychology or mind in general, but is a collection of notes and observations on animal behaviour, mainly that of wild animals, intended rather for the general reader than the scientific student, yet, the writer hopes, of value to the latter, as it is written chiefly from original observation. What has been seen and noted is set forth as simply as possible, though without any sacrifice of accuracy or scientific exactness, in the hope that the plain facts may interest the general public in what our grandfathers called the "lower animals."

The mentality and personality of beasts and birds is an absorbing study, absorbing and entrancing by reason of the discoveries one makes. The longer one watches and observes, the more one learns, the more one is impressed with the mental powers of the creatures around us. Their psychology is no simple matter; these "dumb animals" are not automatons, but beings animated by many and conflicting impulses, desires, and *thoughts*. Thus actions and behaviour, often dismissed thoughtlessly as "instinctive," afford a vast field for research and speculation. The more we study the vertebrate

animals, whether domestic or wild, whether at home or in the field, the more we shall be impressed by what we see; but the great difficulty is always to interpret correctly that which is observed. More often than not we find we have underestimated the intelligence of our subject, for intelligence and personality loom large in Nature. Not the superhuman intelligence we find depicted in some of the sensational so-called Nature stories, but nevertheless real intelligence, real personality—as real, if less, than that of our fellow human beings. It is the object of this book to place before the reader examples of animal behaviour that show the action of the mind, and which throw some light on the "state of mind" of the creature when performing them, from the highly intelligent behaviour of the most "brainy" animals to the less intelligent responses of creatures of lower mentality, in which instinctive behaviour often predominates. As it is "Animal Mind" with which I am dealing, I have confined myself largely to the higher vertebrates, mammals and birds, and left the instinct-governed invertebrate (which is so much at the mercy of its inherited instincts) more or less out of this account. Here and there it has been necessary to mention an insect or spider, but my subject is the mind of the animal.

FRANCES PITT.

October 1926.

POSTSCRIPT TO PREFACE

I MUST thank the many readers of the earlier edition of this book who have written me such kind and appreciative letters, and acknowledge the number of facts my correspondents have put at my disposal, some of which I hope to include in a future work on the comparative psychology of familiar birds and beasts, in which I also hope to emphasize the essential oneness of life, human and animal, and the analogy between our mentality and that of the so-called lower creatures.

FRANCES PITT.

April 1928.

. . . intelligence is, after all, in most cases, the guiding principle of life, supplementing and modifying habits to bring them into closer harmony with the environment, and enlivening every day with countless little acts which result from judgment and experience, and form no part of the inherited complex instincts.

W. H. Hudson, *The Naturalist in La Plata*, p. 210.

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ANIMAL MIND

CHAPTER I

INTRODUCTION

"ANIMAL MIND" was the outcome of a casual remark in the hunting-field. A group of us were waiting at a covertside while hounds drew the wood, when my neighbour, looking up and seeing a rook flying over, said: "Now, I wonder if that bird knows where it is going? Is it off somewhere with a purpose, has it thought about what it is going to do, or is it just drifting round, not thinking at all, but going where the impulse of the moment drives it? Is it merely flying off now because the horses and hounds have frightened it, just flying haphazard without any destination, or is it off to some particular place? I wonder if it has made up its mind what it is going to do; I wonder if it has a mind to make up, or whether," he went on, "it has a mind at all! Has it purpose?"

That chance remark, made so lightly, set me on a train of inquiry, for when I reflected I became

aware how small our knowledge is of the animal mind, how little we know of the mainsprings of action, and how liable we are to cover our ignorance with the word "instinct." A creature does something, its reason, if any, being uncomprehended by the onlooker, so we airily remark, "It acted by instinct." Now instinct, that strange and marvellous phenomenon, looms large throughout the animal kingdom, not the highest of the vertebrates being exempt from its influence, so that even we cannot claim total exemption from its governance; but, as will presently be shown, it is doubtful if awareness does not always accompany instinct, and, at any rate as far as the vertebrates are concerned, if instinct is not usually, nay invariably, modified by conscious control.

Yet this admitted and accepted fact, that many animal actions are the outcome of what we call "instinct," must not blind us to the vast amount of intelligence to be found in Nature. This we are far more likely to under- than over-estimate. When we reflect how difficult, how extremely difficult, we find it to get at the true reasons of the actions of our friends and relations, how often we misunderstand and misinterpret what they do, how often we fail to comprehend the motives even of those nearest and dearest to us, whose minds, after all, are similar to our own, and with whom, moreover, we are able to exchange thoughts by means of speech, is it to be wondered that we should be so ignorant, so vastly ignorant, of the minds of the lower creatures around us?

By the way, the use of the word "mind" is not a slip of the pen, though I am aware that many persons would contend that animals have no minds. Not long ago I was lecturing on animal intelligence, and at the close of the lecture one of the audience, with a marked lack of the thing in question, got up and said it had never occurred to him that animals had minds. Another said the same thing, but added that he excepted dogs, which, of course, stood in a different category to all other creatures. I pointed out that a great deal of the difference lay in the greater opportunity for observation and knowledge on the part of the persons, and that people intimately associated with any particular species of animal invariably consider it exceptionally intelligent. I have heard a shepherd dilate on the "brains" of his sheep, declaring that, far from being "silly sheep," they were far more sensible than most creatures; and certainly some ewes I once knew well were no fools. Orphan lambs, brought up by hand, they always had their wits about them.

When approaching the question of animal intelligence we are faced with individual variation; no two individuals will behave quite the same, no two are quite the same, and in all our deductions we must allow for individuality, otherwise personality. To some people the idea that animals have "personality" may come as a shock, a more severe shock than the suggestion that they have minds. The early Victorian conception of "dumb animals" as beings with no affinity to ourselves, things as

distinct from the human being as clay from gold, has long been lost ; but there are still many persons who have little or no idea of the amount of individuality, otherwise personality, to be found among creatures wild and domesticated, and which extends from the most intelligent down to the least intelligent.

Before going further it will be well to take the dictionary definition of "personality," so as to know exactly what we are talking about—"that which distinguishes a person or thing, or one person from another: individuality." But the word "personality" means to most of us something more, something more which beggars description, an indefinable quality which is—well, personality! We know what we mean by it when we apply it to one of our fellows, that unanalysable distinction that makes a man stand out from the crowd, the individuality which separates him from the herd. But we are all individuals, we all have personality, more or less, some much more, some much less ; and the same applies in the animal world. We find individuals that stand out from the crowd ; we find that no two are quite alike, and that they differ among themselves as much as we do ; and we find that the old conception of animals as "things" (the dictionary says, "thing, *n.* an inanimate object") to be a view based on want of knowledge. The amount of individuality and personality living beings exhibit, so that each one is a separate study in itself, is certainly not realized save by those who give much time to observing them.

But it must not be forgotten that personality betokens intelligence—without intelligence you cannot have individuality ; for the creature that moves at the behest of unreasoning impulse is acting according to its specific type, in accordance with the mould in which it was cast.

Yet again I say that personality meets us at every turn in Nature—in mammals, in birds, and even in invertebrates. It looms largest in the most highly developed warm-blooded creatures, but we meet with it in all sorts of unexpected quarters.

I have laid particular emphasis on this here, in the Introduction, because I want the reader to understand that the accounts given of the behaviour of various birds and beasts in the succeeding chapters are descriptions of particular individuals, and that other individuals would probably have behaved differently under the same circumstances. Generalizations are always rash, and when dealing with animal actions are likely to be most misleading.

Therefore I would again impress on the reader that the following accounts, though as accurate as it is possible to make them, only hold good for the particular individual under the particular circumstances that are set down.

The scope of the book might have been greatly extended by wider quotation from the works of others, but as far as is possible quotation has been limited, because my wish has been to avoid repeating anecdotes. Anecdotes regarding animals are usually of the " good story " variety, and by the time they have been repeated once or twice little inaccuracies

inevitably creep in which utterly destroy their scientific value. These inevitable slips of memory are reduced to a minimum in first-hand records of observations, especially when notes of the animal's behaviour were jotted down immediately after the occurrence. I have therefore kept as much as possible to my own notes, and only quoted from others when it was necessary in order to throw light on a knotty problem.

It may seem curious to some not to have dealt with the important subject of "Instinct" until Chapter IX, nearly the middle of the book, but I wished to draw the reader's attention *first* to the intelligent aspect of animal behaviour; for intelligent purposeful action is of higher import than unintelligent mechanical response.

It only remains to be said that the endeavour to adhere to first-hand observation has necessitated leaving out many interesting species, especially that highly intelligent one, the monkey, want of personal knowledge preventing its inclusion; which is perhaps as well, or the book would have swelled to an unwieldy size.

CHAPTER II

INTELLIGENCE

"INTELLIGENCE is, after all, in most cases, the guiding principle of life, supplementing and modifying habits to bring them into closer harmony with the environment, and enlivening every day with countless little acts which result from judgment and experience, and form no part of the inherited complex instincts."

So wrote Hudson in his *Naturalist in La Plata* (p. 210), yet to many persons the idea that animals have "mind" is a surprise; witness the person referred to in the Introduction, who when I was lecturing on "Animal Mind" got up and confessed it had never occurred to him that animals thought or had any mind. Nevertheless nothing is more strongly impressed upon the earnest observer of animals, and especially of wild life, than the purposeful air that pervades their doings. It is difficult to put into words or to convey to the reader that intangible air of "intention" which hangs over a bird busy feeding, whether it be a starling hunting the grass for grubs or an owl flying methodically up and down the hedgerows on the watch for mice.

In their comings and their goings we can see "purpose"—it is written all over their busy activities; yet much, if not most, of what birds and beasts do can be accounted for and explained in physiological terms rather than psychological ones—that a certain stimulus produces a certain reflex, thus producing action, independently of the brain; that the emptiness of the stomach produces the sensation of hunger, which in its turn stimulates various centres, so that the animal becomes restless and moves about, when the sight of food, this time a stimulus received through the optic nerves, causes further responses that result in the food being picked up.

All of which is excellent so far as it goes, and will do very well to explain the procedure of many of the lower and unintelligent creatures, but it fails to satisfy as an explanation of the behaviour of the more highly endowed beings. It is no more use really than would be a learned dissertation on the internal-combustion engine as an explanation of how a motor-car behaves when it has a guiding brain at the wheel—an intelligence that guides it through the intricacies of a great town's traffic and from place to place. It is very interesting to know how the petrol vapour is fired in the cylinders by means of an electric spark, producing many actions and reactions, and incidentally the power that moves the machine; just as it is very interesting to know how the stimulus of hunger in the bird releases a chain of physiological processes that ends in it going off to hunt for food; but what we want to know in each case is all we can learn about

the "man at the wheel"—that is to say, in the case of an animal or bird, the purpose that animates its comings and goings. Among the things we want to find out is whether the man at the wheel is in absolute control or whether he is but little more than a passenger, just giving the wheel a slight turn now and again.

With ourselves we know he runs the machine almost entirely, it seldom does anything save by his conscious volition: with the lowest animals he lapses into the merest onlooker; but what about the hundred and one creatures that make up the animal world around us, whose purposeful air is so apparent? How far are they intelligent, how far do they think about what they are going to do?

In the chapter on "Fun and Mischief" I shall allude to two tame ravens that co-operated to tease the cats—how one took the victim's attention, while the other sneaked up behind and tweaked her tail; showing not only that each bird knew exactly what he was going to do, but so did the other. They played into each other's hands (or rather beaks!) with an acuteness that was a pleasure to watch, and displayed not only purpose in their actions, but a keen understanding of each other's purpose. There were no unintelligent instinctive responses here, but the use of a very alert intelligence, a mischievous, not to say wicked intelligence, yet none the less a shrewd one. Here "the man at the wheel" was no passenger, but very much in control, just as much as when a couple of naughty boys tease the household cat.

The very fact of a creature revenging itself shows memory, thought, and intelligence, and all the instances cited in the chapter on "Revenge" may be equally taken as evidence of purpose. The elephant spraying water over the men who had teased it, the gander that thrashed the turkey cock, the owl who flew at the housemaid, were all acting with "malice aforethought," with purposive intelligence, that showed the cerebral processes to be in control over those of the lower nerve centres.

Now, though these examples of revenge are excellent for demonstrating that animals do *think*, what about intelligence under ordinary circumstances? Do animals show intelligence in the conduct of their ordinary affairs? The purposeful air with which birds and mammals go about their daily business would indicate that they do, but here is a concrete instance of intelligent behaviour.

My friend, Miss Mary Best, and I had been for three days taking turns to keep watch before a carrion-crow's nest, which contained young ones, for we wished to get some photographs of the old birds feeding the nestlings. From our small hiding-tent we could watch, unheeded by the crows, all that went on. They fed the young birds just as if there was no tent anywhere near, and we had the great pleasure of seeing all the intimate home life of these "brainy" birds. The nestlings were quite big, almost ready to fly, and most voracious, so that their craving for food took some appeasing, but the parents did their best, bringing large consignments, including several frogs, which were

shoved down the wide-open, capacious, hungry beaks of their offspring. Now an entire frog is a good mouthful even for a hungry crow, and each time the fortunate nestling which obtained a frog had a struggle to get it down; but one brought while Miss Best kept watch could not be got down at all. Miss Best's notes, which she has kindly allowed me to quote, run as follows :—

"They"—that is, the old carrion-crows—"carried the food in their throats, as can be plainly seen in one of the photographs. On this occasion it was a good-sized frog. The youngster to whom it was given opened his mouth to its fullest extent, and the frog was ejected into it. As, however, it would not go down the throat as easily as it should have done, the old bird hammered it with her bill, using a considerable amount of force. But there was the frog stuck in spite of everybody's efforts. The parent bird, however, was, like Kipling's mariner, 'full of infinite resource and sagacity.' She seized the frog in her bill, pulled it up again (and by this time it was very tattered), and swallowed it herself. This was obviously to lubricate it a little more, for after a moment's thought she regurgitated it for the second time down the young bird's throat, who then swallowed it quite easily."

Is not that a good example of one of the little acts testifying to judgment and experience?

It may be objected that the crow is a bird of exceptionally high mentality, so let us turn to mammals for our next example; but I must candidly confess that I consider the species I am going to

refer to, namely, the otter, as far ahead of all birds, and most other mammals, in the matter of intelligence. This conclusion was reached through watching my two pet otters—known as Aaron and Moses, despite the fact that they were two females! They showed their shrewdness in many ways, but two episodes have always struck me as being exceptionally good illustrations of their intelligence. I must explain that they were so tame and domesticated that they were allowed to run loose about the premises, and were in the habit of exercising themselves and playing upon the garden ponds. After they had been out for a while I used to call them—they knew their names perfectly and would come to the call as far as they could hear—when they would come racing up from the water, to receive a piece of rabbit meat each and be shut up in their sleeping-shed to sleep off their exertions. But these pools are frequented in the spring by frogs, which come to them to spawn; and otters love nothing better than frogs. With the advent of the frogs the ready obedience of my otters waned perceptibly. They no longer rushed helter-skelter back to the shed when I called them to come and be fed. They came slowly and reluctantly, their sides bulging from the frogs they had found and eaten; and sometimes they did not come at all, but had to be fetched. However, there were days when one would come in and not the other. One morning Moses came rushing up the minute she heard her name. Aaron followed slowly behind. It was

AN INTELLIGENT CROW

1. "There the frog stuck in spite of everybody's efforts"
2. "She regurgitated it for the second time down the young bird's throat"

obvious Aaron did not mean to be shut up if she could help it, though Moses was eager to take her joint of rabbit meat and go to bed. Moses was dancing round me, and Aaron was lying flat on the ground a little way off, regarding us with a sulky air, when she suddenly jumped up, ran towards her sister, grabbed her by the loose skin of her neck, and tugged her towards the pond. She hardly pulled her a couple of feet, for Moses broke away and ran back to me, but a more eloquent performance I have never seen, save when Moses did the same thing, though this time with the object of drawing her sister indoors. On that occasion Moses, who had been kept waiting quite a long time, caught hold of Aaron, who was again the reluctant one, and tried to draw her towards the shed, the only possible interpretation of the action being that Moses badly wanted her food and, knowing from long experience that they would not be fed until both were in the shed, tried to get her sister to come. It failed, for Aaron would not come, and I never saw Moses do it again.

Here is another instance of purposeful behaviour in the otter: Moses is very affectionate, and always runs to me as soon as she sees me, but one morning, when I went to the fenced-in pond where she now dwells, I found her busy bed-making. To provide herself with a comfortable nest she gathers grass and rushes, to say nothing of picking up the straw I place ready for her, and carries the stuff, a mouthful at a time, into her sleeping-hutch, where it is cosily arranged. Well, she was so busy

collecting and carrying off the material that she did not notice me standing on the other side of the fence. I kept quiet until she was in the middle of the pond, swimming with her head held high, so as to keep the grass out of the water, when I called, "Moses, Moses!" She stopped instantly, swung round, as if to rush to me, but paused, turned again, and went on, taking her bedding to the hutch, into which she climbed. In a second she reappeared and, though I did not speak again, swam hastily across the pool, crying "Vut! Vut!" as she landed on my side. She smelt me through the wire netting, then ran along to the door and waited for me to open it. When I did so, and stooped down, she climbed into my arms.

It is difficult to describe the purposeful air with which she completed her journey, and delivered her load, before coming to me. The impulse to come was so strong on hearing my voice that she swung round to do so, only to remember what she was about, and one could almost see the decision to carry on, and take in the load she had in her mouth, pass through her mind. Having got rid of it, she rushed eagerly to me.

A dog, I venture to say, under similar circumstances, would not have waited to think, but would have dropped what it was carrying, and would have rushed helter-skelter to me; for the dog, despite its very considerable abilities, is very much a creature of impulses.

As yet another instance of the intelligence of the otter, I must explain I often bring my otters

into the house, especially into the kitchen, back kitchen, and back yard, for there wet coats do no harm on tiled floors. Now both Moses and Tom, the dog-otter (Aaron eventually ran away, and Tom was obtained as a mate for Moses), are very inquisitive, and examine and explore every crack, cranny, pot and pan they can get at. Cats are not to be compared with them for curiosity—they inquire into everything. Doors especially interest them immensely, and they always try to open closed ones, first by pushing at the bottom, then by scratching at the side, and finally by standing up and stretching as high as they can and endeavouring to get a paw or nose into the crack where the door closes. Our back-kitchen door is in two leaves, being hinged in the middle as well as at the side, and usually only one part is used, but one evening the whole door was swung open. How interested the two otters were. They sniffed and pawed it, they looked through the central hinge and examined the rear portion, they went backwards and forwards round and about it for several minutes ere something else took their attention.

There was but little in the episode to put forward as positive evidence of intelligent behaviour, but when one watched it, it appeared to denote an active and intelligent curiosity.

To return to birds. A pitiable instance of an intelligent effort to cope with overwhelming odds was that of a swan which had nested on an island, or rather a small islet, in mid-stream, on the Severn, just below the English Bridge at Shrewsbury.

Spring floods raised the level of the river to such an extent that the islet got less and less, the water rising nearer and nearer to the nest, and at length reaching it. The brooding bird stuck manfully to her eggs, and with water right up to them endeavoured to raise them above the flood by building up the nest. She gathered quantities of stuff, and interested spectators flung bales of straw over the bridge, which she seized upon, but all to no avail, for the swollen river swept down in yet fiercer flood and bore it all away, nest and eggs being carried off despite the old bird's efforts.

Now nest-building in birds seems so independent of experience and acquired knowledge, so much the result of unreasoning impulse, that one hesitates to cite any examples of it as evidence of intelligent behaviour; yet this swan certainly acted as if she was aware of the danger threatening, and as if she understood that her only chance of saving the eggs was to raise the nest. One could interpret her performance in terms of stimulus and reaction, but why avoid the more obvious interpretation that she raised her nest to try to save her eggs, to try to raise them above the water that was creeping into the nest all the while?

The moorhen is a bird that *normally* indulges in nest-building behaviour which is open to the interpretation that it is acting intelligently, with purpose and intention as to what it is doing. The moorhen is a great nest-builder. It not only makes a platform among the rushes—that is the work of both sexes—to act as a cradle for the eggs,

but it adds to and improves this nest throughout the incubation period, and continues to use it after the young are hatched, taking the active chicks, which can run as soon as they are hatched, back to roost on it at night. And while thus using the nest it continues *to add and improve the structure.* Moreover—and it is this last I wish to stress—it will, and generally does, make extra nests for the accommodation of the young. The two parents think nothing of pulling together a few rushes, laying on them some sticks and reeds, and making a platform above the wet and dirt so that the hen bird can brood her young in comfort.

To dub such an action wholly instinctive seems to me a wilful blinking at the intelligent manner in which the old birds go about it, and the purposeful and thoughtful way they do the work. That platform-building in the moorhen is an innate impulse, as innate as the cocoon-making of the pupating caterpillar, I do not deny, but that it is modified and controlled, altered and improved by intelligent awareness, I do most seriously suggest. But as the nest-building of the moorhen has been studied in detail in the chapter on the nest-building habit of birds, I will say no more about it here, having only alluded to it so that it might be considered in conjunction with the behaviour of the unfortunate swan, and will now turn to other aspects of animal intelligence.

It is commonly stated, usually with the intention of emphasizing the vast difference between animal understanding and our minds, that none of the

lower creatures can count. I consider that a more accurate statement would be that they have no need to count and seldom, if ever, learn to—the "if ever" being a qualification inserted to cover the few highly trained domestic animals that may possibly be exceptions. When we remember the slow and painful process that the acquirement of arithmetic was to us in our youth, can we be so sure, for all our brains, that had we no oral or written language, no means of communicating concrete facts or abstract ideas to each other, that we could count, or do the simplest sum in addition? It is noteworthy that primitive people cannot count much.

Dr. C. Christy, writing of the Pygmies of the Ituri Forest region of the Congo, says: "I do not think they can enumerate beyond ten" (*Big Game and Pygmies*, p. 47); and he goes on to describe them as a most primitive people, having almost no idea of cooking, living by hunting, with only little leaf huts for shelter, and knowing nothing of any form of cultivation. Yet these people have a language and can convey definite ideas to one another.

It is my opinion that no creature save man can definitely count, a system of numerals being needed to enable them to conceive more than one, two, and three, but that the more intelligent beasts and birds know the difference between one or two and many, possibly between one, two and three, though most birds cannot distinguish between one and two. *Fair* tests of counting ability are

extremely hard to devise, especially on wild animals, for experiments on captives generally and necessarily include some element that flurries and upsets the subject. This objection particularly applies to those tests of intelligence that involve shutting the animal up in a cage from which it can release itself by pulling a string or pressing upon a spring. Even cats and dogs, let alone wild animals, are excited and worried when they find themselves confined in a strange box, and are in no condition to use their wits. Results, whether positive or negative, are valueless under such conditions. But this is a digression from the question under consideration—can birds and mammals count at all? What evidence is there that, as I have stated above, they know the difference between one or two and several?

Birds and their eggs afford us a test and evidence on this point. Take a hedgerow bird like the blackbird, and remove from its full complement of five eggs one of the number, and it will continue to incubate the remaining four undisturbed by the loss; but if you take away half the clutch it will almost certainly desert. Apparently it does not, cannot, count its five eggs and tell when one is taken; but it sees at once the difference between few and many. This applies to nearly all birds, at any rate to all I have experimented with. But if there are only two eggs in the nest and you take one, then the bird usually deserts at once—I say *usually* because some individuals are less easily upset than others, or are bigger fools! Here we

have evidence that points to the bird knowing the difference betwixt one and two and between few and many.

The bird photographer, with his hiding-tent, that he erects near the nest, and in which he ensconces himself and camera, also throws a little light on the problem, for he has an especially good opportunity to study bird mentality. My experience is that with the smaller species it is a case of out of sight, out of mind, and that warblers and such birds do not worry once you are in the tent and out of sight, but go on happily about their business. But with birds such as blackbirds, thrushes, plover, snipe, hawks, etc., the case is very different. There is no out of sight, out of mind. If they have seen you go into the "hide" they do not forget you are there, but are very anxious and unhappy, refusing to come near the nest until you remove yourself.

I have a very vivid recollection of trying to photograph a merlin at her nest, which contained five lusty eyasses, from a "hide" that had been in position for weeks, and to which the birds had become quite used; but she saw me go into it, and nothing would induce her to come near: she sat on a stone on the opposite side of the ravine and screamed abuse at me. She knew I was there as well as if she could see me. At last my friend came to see how I was getting on, looked in at the tent, and then walked away. The little hawk and her mate were immediately satisfied. They had seen a human being go away from the tent, and therefore all was well. Within five minutes the

beautiful little falcon was feeding the hungry eyasses on a freshly killed pipit ; and in yet another five minutes she was back to feed them again, this time *alighting on the roof of the hide,* where she pattered about within an inch or two of my head !

Many times after did we prove the fact that if two people went up to the tent, and one walked away, the merlin was happy and satisfied—she certainly did not distinguish between one and two, between the two that went up to the nest and the one that walked away. But as she and her mate were always much disturbed and excited at our approach, this does not really prove she could not count two. Had it been a question of eggs in the nest, she would almost certainly have missed it if there had been two and one had been subtracted.

Nearly all birds can be deceived in this way, and cease worrying about the occupant of the tent when they see a second person walk away. The exceptions are the crows and raven, which wily birds have in some cases shown ability to count, as the following remarks from the notebook of the Zoological Photographic Club's portfolio show.

Giving his experience with carrion-crows, Sir Thomas Lewis said : " On a lake there is a small island one hundred yards from the place where many rowing boats are kept. A pair of crows built in a low may-bush on the island this year. The island is about twenty yards across and has the remains of a stone hut at the bottom of the may-bush and an ash-tree quite close to and overlooking the may-bush. In fact, from about twenty

feet up the said ash-tree you could look right into the nest. The site was absolutely unique. A perfect light, a hide on the ground almost ready and a frequented spot. I put a roof on the natural hide, fixed a sack (which was originally hanging on the may-tree) up the ash where the camera was to come, and trimmed several branches off the may-tree; and each of these steps was completed with so little interference with the birds, that the old lady was always on the nest again before I reached the boat stage. It was done over a period of about four days. Next I took a dummy camera up the tree, tied the sack over everything, except the dummy lens, and left the island. No demur from the crows (back in ten minutes). The dummy was left up four hours, when it was replaced by the camera, and I got into the ground hide. A friend took me to the island and rowed away with my dummy sitting in the stern. In ten minutes the old birds were both on the island, all over it (except on the ash-tree) and making a huge fuss. After an hour my friend took me away. We rowed out on the lake, and again the birds came back; all over the island, except the ash-tree and the nest. Watched them from a distance for an hour, when they flew off. Went and took the camera down. Birds never returned to island or nest. So much for Mr. Carrion Crow!"

Commenting on this, Mr. R. E. Johnson remarked: "T. L. should have been left in hide by two of his friends. Crows can count up to two, and when photographing a pair last spring I found it useless

to be left in hide with one person going away. Even when left by two friends it was hours before the birds came anywhere near the nest."

Yet that the cunning of this species and its near relative the hooded crow varies is shown by the comments of two other bird photographers in the same notebook, to the effect that they had had no trouble with either bird, and had obtained pictures of them after being left in the tent by but one friend.

My own experience with crows was similar to that of the latter observers. When a friend walked away, the birds I was trying to photograph seemed quite satisfied and returned and fed their young, but they were, I think, an exceptionally bold pair.

The raven, as might be expected of a bird of its keen mentality, is very difficult to deceive, and the departure of two or three persons is needed to convince it that all is well and the " coast is clear."

I think we may conclude from all this that birds are only able to compute in the most rudimentary way, and that the nearest approach to real counting will be found in the crows and ravens, and that even in their case they merely form a rude conception of one, or two, or many, as the case may be.

The same probably applies to mammals, but the difficulty of testing them has already been alluded to. The trick performances of trained animals, horses and dogs, etc., are, of course, beside the point, for it is the natural creature we want to understand; and in trying to get that understanding it is well we should bear the Ituri

Pygmy in mind ; and not forget that though he has achieved a fairly complicated language, and so on, he cannot get beyond ten.

* * * * *

In this chapter an endeavour has been made to show something of the mentality of the more intelligent animals, how in their actions they betray intention and purpose, but that their abilities, as in counting, are, even in the most "brainy" species, limited in extent.

The next chapter will also deal with intelligence, and will show that memory plays its part in governing their actions, and that experience is as great a factor with them as with us.

CHAPTER III

INTELLIGENCE (*continued*)

SOME writers on animal psychology will tell you that no creatures without an oral language can think, that the power to put one's concepts into words is a necessity of thought; but did not the two ravens that teased the cat by tweaking its tail think? (See Chapter V.) They must have done. How much of our thinking, especially recollection, is done in words? Some may be, but the greater part is done in memory-pictures, scenes revisualized by "the mind's eye." We may assume, fairly safely, I think, that all thought of birds and beasts takes this form, vivid memories of their haunts, of their fellows, and of fun or sport enjoyed surging through their minds, especially when at rest and not occupied with present happenings. The dog lying at ease by the fire hunts his rabbits yet again, so that even as he dozes he dreams of them, his feet twitch, and he whines in his sleep, until we give him a kick and tell him to shut up and not make a noise. Troubles too, as well as pleasures, are recollected and even dreamt of. When my two female otters

were twelve months old, Aaron ran away (a wild dog-otter was the cause of the elopement), leaving Moses alone. This latter fretted most pitiably and inconsolably for her sister, and often, to try to comfort her, I have taken her up in my arms and nursed her. Sitting with her thus one day, the otter dropped off asleep, only, it was plain, to dream of her loss, for as she lay with closed eyes in my arms she sobbed in her sleep, a plaintive little sound, half sob, half squeak, and her limbs twitched as if she was running.

But even the most intelligent animals show comparatively little ability in putting these memories together so as to have a guide to their future conduct. They do indeed profit by experience, but, like small children, they are prone to act "on the spur of the moment," and seldom look far ahead. This is not to say they never look beyond the happenings of the minute, but that, like the young child, they live chiefly in the present.

Examples of looking a little ahead, of purposeful action, are when two dogs, after smelling noses and sniffing at one another, trot off together, on poaching bent, to reach a somewhat distant hunting-ground; and when the two otters used to depart on a frog-hunting trip. Aaron and Moses discovered a marsh about half a mile from the house where frogs were abundant, and many a time have I seen them, after playing about for a while on the ponds, land on the bank and proceed to dry themselves by rubbing and rolling, after which one would approach the other, smell her, and say,

"Vut! Vut!" at the same time running a few steps up the bank. If Number 1 did not follow, Number 2 would trot back and repeat the performance, but a second invitation was seldom needed, and off they would go, cantering side by side, as if in double harness, up the drive, over the main road, and away down the fields to their beloved marsh, whence I had to fetch them back.

In observing wild creatures it is often most difficult to tell where instinct stops and intelligence begins, and we are undoubtedly in far greater danger of ascribing to instinct actions that are really intelligent than we are of mistaking instinctive behaviour for that guided by intelligence. For instance, we commonly hear the peculiar snail-breaking habit of the song-thrush spoken of as an instinct, and so it would seem to be, but when I experimented with a young thrush I found, I must confess to my surprise, that it had no instinctive knowledge of what a snail was or how to deal with it.

Before telling what this thrush did I must mention that the wild song-thrush is *very* fond of snails, especially the common banded snail, *Helix nemoralis*, and that it extracts them from their shells by pounding them upon some stone, or other hard object, which will make a convenient "anvil." Sometimes the anvil will be a pebble on the garden path, or a roadside stone, or even a sun-dried clod of earth. I have heard of a limpet's shell being used. The only necessity is that the anvil must be a hard object, of a convenient height and shape

to hammer the victims upon. A really good anvil is used again and again until the ground round it is littered with the fragments of the shells. I have seen a thrush carry a snail over a hundred yards on purpose to smash its "house" open upon a favourite stone, though there were many others close at hand which to my eyes looked equally good.

Now when my thrush was fully adult and equal to dealing with any ordinary difficulty in the eating line, I obtained some snails, all average sized examples of *H. nemoralis*, and offered them to him. I put them down on the floor of his big cage and waited events. Afterwards, when he knew all about snails, Jack, as the thrush was called, used to get greatly excited, chirp, and flutter about, if he saw me with one in my hand. These first ones did not interest him in the least; at least, not so long as they remained inanimate on the cage floor. He took no notice of them until one put out its head and began to move about, whereupon he flew down from his perch, watched it for a moment, and then pulled its waving tentacles. The poor snail hastily retreated into its shell, to the bewilderment of the thrush, who seemed to wonder what could have happened to it. He turned it over, but could make nothing of it, so tried another snail, that had likewise begun to move about, with similar results. Losing interest, he flew up to his perch. Presently the two snails put their heads out again, and once more their waving tentacles caught his eye. Down he flew, pulled their antennæ with vigour, and looked most surprised when once more the snails

THE THRUSH AND THE SNAILS

1. " Unable to make anything of them "
2. " The snail slipped from his beak "
3. " He had cracked his first snail "

withdrew. He peered at them, and gave the shells a tentative peck, but, unable to make anything of them, soon left them again. It was obvious that Jack had no idea that the snails were good to eat, nor how to get them out of their shells.

Daily for a week I showed him snails, and each time he was most inquisitive about them, turning them over, pecking the shells, and trying to make out where the inhabitants disappeared. One morning he picked a snail up by the lip of its shell and shook it, just as he would have done had he been killing a large earthworm, but it slipped from his beak, and there, for the time being, the matter ended.

On the sixth day the thrush seemed to lose all patience—a couple of snails began to crawl about the cage, and when he flew down to investigate the nearest, it, as usual, vanished into its house. He picked the snail up by the lip of its shell, swung it backwards and forwards, and brought it down with such a thump on the ground that it flew from his beak and half across the cage. He hopped after it, picked it up, and, jumping on one of the anvils—the experienced thrush stands *before* the anvil, not *on* it—for I had put an assortment of stones ready for him, beat the snail several times upon it, hitting it first on one side, and then on the other, with a swinging, to-and-fro motion. He was not expert enough, however, to crack the snail's shell, and it slipped from him and rolled away. But he seemed pleased with his discovery that the snails could be hit on a

stone, and went on trying first one shell and then another, until, after fifteen minutes' hard work, one, weaker in the shell than the rest, gave way. He had cracked his first snail! Once the shell was broken, it did not take him long to pound it to bits, extract the snail, and swallow the succulent morsel.

After long trying he had discovered how to deal with snails, and henceforward he practised daily—that is, when I could find sufficient snails—so that he was soon an expert on the anvil, and able to open a snail with a few blows, whereas to begin with it had taken him a long time and much hammering to break the shell.

It was very evident that he learnt by experience and experiment, and that there was no specialized instinct leading him to break snails automatically. The true instinct in the matter was the thrush habit of beating any unwieldy or unmanageable food; a big earthworm, for instance, being killed by being beaten and hammered on the ground until the life was knocked out of it. Jack beat everything on the ground that was at all troublesome or which he did not understand, and if especially difficult usually took his treasure-trove to some hard object, just on a level with his beak, on which he could beat it still better than on the floor. I have even seen the thrush pick up a pill-box and hit it against the leg of a chair! Also a small roll of paper was usually treated in the same way, as indeed was any little thing that was strange to him.

From this we see that, contrary to expectation, a thrush's behaviour with regard to snails is the outcome of intelligent effort, based on a substratum of instinct, the latter being the innate predisposition to kill grubs and worms by beating them before swallowing them. Moreover, it shows how extremely difficult it is to tell, except where direct evidence like this is forthcoming, where instinct ends and intelligence begins, and how much we should attribute to the "man at the wheel" and how much to instinct.

A great deal that later in life is undoubtedly intelligent is in the beginning equally undoubtedly automatic. The newly hatched chick of our domestic fowl pecks instinctively at any small, bright, or light object, without regard to whether it is edible or otherwise. A small white pebble is as likely to elicit the pecking response as a crumb of bread or some grains of corn—it pecks indifferently at anything which catches its eye. But the matured hen pecks with purpose—to pick up corn which she knows is good, to secure a grub, or something else which her experience has taught her is good to eat.

Experience and memory, otherwise educatability, play a large part in fitting all the more highly organized creatures for their journey through life. Just as we have to learn, so have they to be taught their lessons. First of all they have to find out what is good to eat and what is not. The young calf or fawn has an inherited liking for a herbivorous fare, and the young tiger and the young eagle for

a carnivorous one, just as the seal has for fish and the insect-eating birds for insects; but within these limits they have to acquire knowledge of what is good and what is not, experience which is often dearly bought.

My observations and experiments convince me that few, if any, birds and beasts have any instinctive aversion, or (if one may use the word "knowledge" in connection with instinct) any instinctive knowledge of noxious animals, insects or plants. It is only by experience and experiment that they find out what is good to eat and what is not.

The common toad, *Bufo vulgaris*, has an efficient means of defence against attack in the acid secretion of its skin, which secretion is always emitted when it is annoyed. This is so strong that it makes a dog, which has picked one up, froth at the mouth and exhibit every symptom of pain and discomfort, and equally distresses other creatures which have inadvertently touched one. Yet all young animals have to find out for themselves how very nasty toads are—no warning instinct stops them pouncing on the plain-looking, insignificant toad. I shall never forget the episode when Aaron the otter, as a young cub, found her first toad. She had turned over a stone to see what small game, such as slugs, were sheltering beneath it, and there, in a hollow in the soil, was tucked the toad. It shrank away as she pushed her nose against it, and instantly aware that here was something alive, she made a grab at it and pulled it out of its retreat. The

other otter-cub came up to see what her sister had found, but Aaron was too delighted with her find to tolerate interference. Squeaking, grumbling, and shouldering Moses off, she carried the toad on to the lawn. Still growling threats, she began to play with the toad, biting it and tossing it into the air, whereupon the poor ill-treated creature used its one and only means of defence. The otter dropped the toad, shook her head with every sign of discomfort, flung herself on the ground, and scraped at her mouth with her forepaws, especially clawing at her teeth, as a cat does when it has a fish-bone stuck in its throat; but, of course, this did not ease the pain (I presume the acid produces a burning sensation—the symptoms are those of great discomfort), and she then rubbed her muzzle on the grass, rolled frantically on the turf, and, lying flat on her back, clawed again at her mouth. Of course it was in vain, that horrible taste was not so easily got rid of, and it was between five and ten minutes before her peace of mind was restored. But, mark the sequel, a few days after Aaron found another toad, found it lurking in a hole in a bank, but this time there was no hasty grabbing; she drew the toad forth very carefully, tossed it from her as if she was afraid of it, picked it up delicately by one hind foot, and with head held high bore it off to the pond, where she proceeded to wash it, throwing it about, diving with it in her paws, and coming up to fling it high in the air again. Thus she played with it for ten minutes or more, until it was washed clean and

in a fit condition to eat, when it was speedily demolished. It should be noted that otters, unlike racoons, do not normally wash their food, though they will play with a catch when in a playful mood. Before finally devouring the toad, Aaron brought it ashore, laid it on the grass, and pawed it, rolling it between her feet as if to rub off the distasteful matter.

The point I wish to stress is that one lesson was sufficient to teach this otter the unpleasant nature of toads, that though the sight of a toad meant on first acquaintance nothing to her, her experience was not forgotten when she found another a few days later. Her subsequent behaviour, i.e. the washing of the toad, was, I think, experimental and intelligent, a successful experiment as it turned out, but has no bearing on the point under consideration, namely, that in the higher animals the question of what is and what is not good to eat is a matter, within limits, of education, not of instinctive recognition.

As a further illustration, take the case of a tawny owl, a pet one, known as Hooter, which I offered a toad. Owls are not very particular birds and habitually eat creatures like shrews (which cats, dogs, and foxes will not devour) and newts (the great-crested newt is too nasty for an otter to eat), so I was quite prepared for Hooter to swallow the toad. He took it, it is true, and that without the slightest hesitation, gave it a good pinch, and dropped it as if it was a hot potato. For the next ten minutes he was very busy rubbing his beak on

his perch! Never after would he look at a toad, though he liked frogs, which, by the way, are equally beloved by otters, which know them at once from toads, and grab them greedily.

It may here be objected that the toad, despite its powers of defence, does not advertise its noxiousness by a warning uniform, and that there might be instinctive recognition of unpalatableness if dressed in appropriate colours. It is generally conceded that the currant moth (*Abraxas grossulariata*) caterpillar is warningly coloured, for its black, white, and yellow uniform is most conspicuous; it feeds by day, and is severely left alone by insectivorous birds. So to test the question of whether there is any instinctive avoidance of brightly coloured insects, I placed some of these larvæ before Jack the thrush. He noticed them at once, hopped down from his perch, and picked one up, gave it a pinch, dropped it, jumped back on to the stick, wiped his beak vigorously, and took no further notice of the caterpillars, which gradually crawled away. Nor would he in future take any interest in currant-moth caterpillars. He had learnt that they were nasty. This bird was quite ready to sample any small moving thing put into his cage, even to "woolly bears," which, needless to say, he did not attempt twice.

He convinced me that the rôle of warning colours in Nature is to facilitate education, not to rouse an instinctive response, and that most birds, and nearly all mammals, depend on experience in the matter of food selection.

Enough has been said, I think, to show that, like ourselves, the higher creatures, especially birds and mammals, learn by experience—experience often dearly bought, but experience which enables them to adapt themselves to the fluctuations and alterations of their environment, and to act in the manner most profitable and least harmful to themselves under any given circumstances. Here we have, from an evolutionary point of view, the advantage of intelligence over instinct, and the reason for the success on this planet of the warm-blooded, big-brained creatures that have appeared at the tail of the palæontological succession. Instinct is immutable, as far as the individual is concerned, and quite incapable of adaptation; intelligence is supremely adaptable. Again and again we are impressed with the fact that success in the race for existence has always gone to the species with more brains than its fellows. One after another have creatures with larger and larger cerebrums arisen, each surpassing its predecessors, only to be surpassed in turn by *man!*

CHAPTER IV

TEMPERAMENT AND PERSONALITY

REFERENCE has been made to the way individuals of a species differ from one another; and to show how large temperament and personality loom in Nature, I propose devoting a short chapter to instances, taken almost at random from both domestic and wild animals, of the wide differences between individuals.

No one expects two dogs or two horses to be alike in temperament, or even two cats. We know they will be as different as "chalk from cheese." With these creatures that the concerns of our daily life bring us into constant contact we have a familiarity that has taught us to expect individuality. One dog will be of a bold, confiding disposition, friendly with all and sundry; his litter brother will be just the reverse—shy, nervous and retiring, easily cowed by a harsh word or look, and deeply suspicious of strangers. How, too, do horses differ, and that irrespective of breed. One will be keen and energetic, his fellow just the reverse, and a third will be so nervous that he shies all over the road. Cowmen will tell you the same thing

of the cattle under their charge: the "drop-horned cow is a nice quiet creature, but the wide-horned one is nasty to the others, and old Susie is a demon if anything upsets her." As for sheep, as mentioned in the Introduction, every shepherd says the same—no two are alike; and when questioned he will reel off a list of their individualities—how "the old black-faced ewe is always first to the trough, how that woolly-faced one defies the dog when he is sent to bring her up, and how the white-faced one will get out if she can." The person in charge of pigs tells the same story: he reels off descriptions of their differences, their peculiarities, and their little ways; and so we go on through the domestic animals, their attendants, who know them intimately, all impressed with their individuality, and each ready with stories of its expression, and the doings of some animal of exceptional personality, from the old ewe who would not stay with the flock, but came back to the farm buildings whenever the weather was bad, to the bull who likewise came home when he chose, prising the gates that barred his way off their hinges by means of his massive head and horns.

But the purpose of this chapter is not to retail anecdotes of domestic beasts, but to give actual observations of temperamental differences in wild birds and beasts, especially between individuals of the same species. Two lapwings afforded a good instance of this, the one being as shy as the other was bold. I had put a tent some way from the nest of Number 1, which contained four eggs,

THE LAPWING THAT DID NOT MIND THE CAMERA

that the bird had been sitting upon for a week. It was left for several days so that she might get used to it, and then moved up nearer the nest, after which I entered it in the hope of getting some pictures of her. "Entered hide at 9.25," I wrote in my notebook, "and was hardly settled in tent before the pewit was near; she ran up within a few yards and stood preening her feathers, while the wind blew her 'top-knot' to and fro. She was a charming sight against the fresh green of the young wheat and the red clay, her greeny-bronze plumage being very handsome. All the same, she looked a bit shabby, as if the duties of sitting were already telling on her. Suddenly, after coming close to the nest, she cried 'Pe-wit!' and flew off, disappearing from sight. At 9.40 a crow began to croak, and immediately several pewits flew screaming overhead. (Query, were they trying to drive off the carrion-crow?) The noise died away after five minutes or so, when the plover came back and stood about ten yards off, preening her bronze feathers and looking somewhat doubtfully at the tent. She was evidently disturbed at it having been moved so much nearer, and the unwinking eye of the camera possibly added to her worry. She stood with her back to the wind (lapwings usually face the breeze), and it ruffled her feathers. At ten she went away, but returned after a while. She kept going away and coming back at intervals, but seemed suspicious, owing, I think, to my having come to the tent alone. At any rate, this lapwing would not come

near her eggs. At 10.45 her mate came with her—a very handsome fellow, with a blacker gorget and a longer plume. He tried to drive her home, chasing her towards the nest (just as if he did not like the eggs being left to get cold), but she turned on him and drove him off, when they ran around, until both took flight; I was now afraid of the eggs being spoilt, so left. I returned in an hour and a half, this time with two companions, who saw me into the hide and then walked away; result, the bird screamed 'Pe-wit!' after them until they were out of the field, flew quickly back, alighted near the nest, walked straight to it, fluffed out her white breast-feathers, and cuddled down on the eggs. After that she paid little or no attention to the tent, or what went on in it, and I was able to take my photographs—yet the next day she deserted! Coming back to the tent with companions as before, she failed to return. I waited for a time and then left the hide, but the following day the eggs were stone-cold. Who can say what had upset her? Why had she been quite indifferent to the tent and my occupation of it overnight and been scared away the next morning? We can only say that she was a pewit of temperament!"

However, there was another lapwing's nest in the same field, so I moved the hide over to it and put it up quite close to the eggs. The owner was a much bolder bird than the other and paid little attention to the tent, soon returning to the nest. When I got to work with the camera the difference

was surprisingly great. I was using a very noisy focal-plane shutter, that went off with a report like a pistol. Each time it went down the bang startled her off the eggs ; she would literally jump into the air, yet in a few minutes she would run back to them and settle down again. The first pewit would have been scared out of the parish. Of Number 2 I was able to take as many photographs as I wanted.

As another example of difference in temperament of birds of the same species, take a pair of golden plover studied in the Shetlands. They had a nest on a wind-swept moor—the Hill of Fitch, near Lerwick—which nest was only found by good luck. I had been watching the cock, an exceedingly handsome little fellow, with the extremely black gorget characteristic of the Shetland race (this form has been described as a subspecies of *Charadrius apricarius*, but it is doubtful if it merits that rank), and I felt sure from his anxious mien that there was a nest near. He had drawn my attention by a plaintive whistle, a single note, repeated at intervals, that seemed the very spirit of these wild and lonely islands. I had lain flat in the heather while he patrolled within ten to fifteen yards of me, stepping daintily between the peaty tussocks and affording a good view of a golden plover, that shyest of wild birds, at close quarters. Eventually he went away, and rising, I searched for the nest, searched long and carefully, but was giving up in despair when a plover jumped up almost under my feet. She—for it was

a hen—floundered away, doing the broken-wing trick most elaborately. She ran quite sixty yards, trailing her wings, before she took flight and skimmed away. There, just before me, was the nest, a cup-shaped depression in a tussock consisting of grass, sphagnum, and short heather, containing four handsome eggs. The female golden plover in the meantime had come near again, and was again feigning injury, so I went away and left her in peace. Next day a hide was put up close to the nest, and the following morning a friend and I were ensconced in it, to try to get some pictures of golden plover—no easy task with the tent quivering like an aspen under the force of a Shetland gale.

We had not been five minutes within before we saw the hen bird coming home. She was quite distinct from her mate, having a speckled front, instead of the "black satin choker" he sported. She had been on the nest when we came to the tent, and as we saw her coming back we congratulated ourselves on having met with a bold and confiding bird. On she came, the cock following, when an extra violent gust of wind set our frail tent flapping; in an instant the two were skimming away across the moor. Ten minutes passed, and the male bird reappeared, walked boldly up to the nest and settled down upon the eggs, brooding them as if born to nursery work. With his large lustrous dark eyes fixed on the strange object before him, he fluffed out his feathers and cuddled the eggs beneath him. After a little experience of

the noises we made in releasing shutters, resetting them, changing slides, etc., he became absolutely indifferent to all sounds. On the second day we could talk, and even shout, without disturbing his serenity of mind. It was quite difficult to get him to look up when we wanted to take a photograph; and as to moving him off the eggs, that could only be done by desperate means, such as waving a scarf through a peephole or showing oneself.

Yet, though the cock was so bold and confiding, the female never came near. As a rule the bird photographer finds the hen less nervous than the cock, yet here was the female remaining obstinately away and leaving incubation to her mate. Well and bravely did he fulfil the task, all his four eggs being on the point of hatching when we had to leave Lerwick, and I afterwards heard from a local naturalist that he not only got the brood off safely, but his mate had returned to look after the chicks.

What a contrast in temperament these two birds afforded—the one so timid that she dare not come back to the nest after being once alarmed, the other so bold that it was difficult really to frighten him. See my book, *Shetland Pirates* (published by George Allen & Unwin, 1923), for a fuller account of this pair.

Working at another Shetland bird, the Arctic or Richardson's skua (*Stercorarius parasiticus*), I also found individuality very marked; one bird of a given pair being shy and cautious, diffident about coming back to its eggs, and only settling

down after carefully inspecting the hide from a safe distance, while its mate would be just as bold. The great skuas (*S.s. skua*) were invariably bold, but then, as might be expected of birds that gain their living in such a manner, chasing other gulls until they disgorge their food, they have little fear of anyone. They cared not a jot for a hide or camera, and would even stoop at us as we walked near their nests. However, they too showed individual differences of temperament, some being even bolder than the others.

Among the birds of prey (hawks and owls display an intelligence of a far higher order than those unacquainted with them would expect) we find considerable evidence of personal characteristics and temperamental differences. The specific differences, too, are very great. The short-winged hawks, sparrow-hawks, and goshawks are all very highly strung, nervous creatures, whereas the long-winged hawks—peregrine, merlin, kestrel, etc.—are comparatively placid, though again the individual variation is enormous.

But going back to mammals, in which individuality is perhaps even greater, and then turning to my two otters, litter sisters, of whom I have said so much, and hope to say still more, (!) we have here personalities as distinct as any human ones—Moses quiet, tractable, and affectionate; Aaron self-willed, disobedient, and headstrong, with little affection for me, and not much for her sister.

These random examples of temperamental differences in birds and animals, both domesticated,

THE GOLDEN PLOVER THAT WAS AS BOLD AS HIS MATE WAS SHY

1. "Walking up"

2. "Settled down"

tame, and last, but not least, under natural conditions, combined with references to personality and individuality in other chapters, will serve to show the reader that when we refer to the " personality " of a wild animal it is no fancy term, but a reference to what is as real as the personality of one of ourselves.

CHAPTER V

FUN AND MISCHIEF

NO one who has spent time watching animals and birds can doubt how much they enjoy some fun. I do not mean only the young ones, but elderly and presumably staid individuals.

The generally accepted theory regarding the play of young creatures, whether lambs, kittens, fox-cubs, young rooks, or kestrel eyasses, is that it is a provision of Nature to enable them to get fit for the stern realities of life; that the kitten and the fox-cub get eye and muscle atune, that the rook and the young kestrel thus achieve mastery of the air. No doubt there is something in this, but it does not explain why adults, who have long learnt their business in life, should likewise enjoy a game. Take, for instance, the old cock raven I watched by a Westmorland crag, and who indulged in strange antics.

I was watching for a pair of peregrines, that had their eyrie half-way down the great cliff, when the raven's harsh voice drew my attention to him. I knew there was also a raven's nest in the crag, and that the hen was sitting. Looking in the direction

of the sound, I saw the male bird flapping by, flying along parallel to the face of the cliff. He flew to and fro several times, giving an occasional caw, when, apparently getting bored with his "sentry-go," he began to play, indulging in the weirdest antics. He dashed upwards, only to fling himself headlong downwards, recovered, and darted up again; then he tried another "stunt," a side roll, in which he turned completely on his back! This he repeated several times, going right over, and pausing sufficiently long to make me amazed that he never lost control and side-slipped to the ground. But there was no fear of that; he was a master of the air indulging in a few antics, and knew exactly what he was doing. He played on for about ten minutes, after which he resumed his solemn patrol along the face of the cliff.

As a further example of the playful, not to say impish spirit of the raven, I must mention the behaviour of the two tame ravens. Ben and Joe, as they were called, had a feud with the cats, and when a cat came into the yard where they dwelt there was soon trouble—for the cat, that is! Their programme was as follows: As soon as a cat appeared one of the ravens stalked forward and took her attention. He would hop towards her, jump back, dance round the pump, and sidle towards her again—a mixture of impudence and caution most amusing to behold, and very worrying to the cat. She usually sat down, flattened her ears, and spat at him. If it was Ben who was thus engaging her attention, then it would be Joe

who was creeping up behind, preparatory to taking her in the rear. A step at a time, one by one, he would get nearer, moving sideways with crablike action and looking the personification of wickedness. "Craw-ak!" would say Ben in front, ruffling his feathers and keeping the cat's eyes fixed on him. Gingerly and gently Joe would get a few steps nearer, nearer and nearer to the cat's outstretched tail. There it lay, the tip twitching spasmodically, as a cat's tail will when she is not too happy about something, and Joe's beak getting closer. A moment later that black beak, strong as a pair of steel nippers, closed upon it. Oh! poor puss! With a frantic cry she sprang about, but Joe was away across the yard, and Ben, seizing the opportunity and likewise her tail, had the cat from the other side. So it went on; whichever way the unfortunate cat turned there was a raven ready for her, and at last she had to beat a desperate and undignified retreat, springing up into the creepers on the wall, and thence, in a storm of hissing and spitting, over the top of it.

No one watching the two could have doubted the devilish mischief of it all, and their chuckling croaks after the cat had been put to flight sounded just like laughter. The episode, as mentioned in the chapter on "Intelligence," shows the mental ability of the birds, and a power of playing into each other's hands (or rather beaks!) that is rare among wild creatures. Moreover, "purpose" was written large upon their actions—purpose that was apparent from the instant the cat was seen by them.

Less preconcerted, but not less mischievous, was the way Ben and Joe would tease each other when bathing. The ravens were very fond of washing, and whenever one got into their bath, the other would be sure to follow him, get behind him, and slyly pull his tail feathers. Number 1 usually jumped out, when Number 2 jumped in, but "in less than no time" Joe would have Ben out again, and so they would go on, splashing water far and wide, and obviously enjoying themselves hugely.

Birds that are seldom credited with much intelligence are peafowl, yet I have seen them behave in the most mischievous way, and show an enjoyment of an impish prank almost equal to the ravens' glee in teasing. The particular birds I have in mind were a young cock and a young hen, each about twelve months old. The hen began the game, which consisted in walking after a staid old fox-terrier and giving him a sharp peck when he was not expecting it. He usually sprang round uttering a startled and angry yelp, when the peahen would jump into the air and flap a few yards out of reach; but in a few minutes she would stroll after him again, when the dog, awake to what was coming, usually betook himself to his sleeping-place, followed thereto by the peahen, sidling along behind him, and evidently waiting an opportunity for another peck. The young cock improved on these methods when he took a hand in the game; he flew at the unfortunate dog, hitting him on the head with his feet. The frightened and angry terrier very nearly took a drastic revenge, grabbing

at the peacock's tail, but the bird had flown out of reach, to take perch on a gate, where he sat and shrieked in triumph. No one watching the behaviour of the two birds could have doubted they were teasing from mischief and delight in impish fun.

Turning for the moment from birds to mammals, I must again refer to my pet female otter, Moses, who is one of the most playful creatures imaginable ; and not, like the peafowl and the ravens, with anything malicious in her fun. She plays with me like a kitten, racing round after a bit of stick tied to a string, springing upon it, and shaking it, and pretending it has to be killed. Then she turns to me and, rolling upon her back, indulges in a mimic fight, lunging, and sparring with great delight—yet she is no cub, but an elderly dame of nearly four years old.

When she and Aaron ran about together, they had the maddest romps, racing, rolling, and tumbling each other over in the wildest play. They would churn up the pools until the water was splashing far and wide, then jump ashore and play hide-and-seek among the bushes. Here a certain practical-joke element did enter into their fun, for it was the delight of whichever was behind to catch the other in mid-gallop by her long tail, pull her up short, and roll her over.

One of their joys was to slide in the snow. They flung themselves flat on their stomachs and shot along for several yards, especially if there was a slight gradient to toboggan down. This amusement is not peculiar to young otters, for Moses still

practises it when she gets the chance, and I have seen the trail left by a wild otter when he has been amusing himself in this fashion. Many accounts have been given of wild otters making mud slides on the river bank just for the delight of tobogganing down them, especially the Canadian otter. As regards *Lutra vulgaris* it cannot be a common habit, as I have never come across a slide (I mean a regularly used slide on the river bank), though always on the look-out for one. Yet the following account of an episode seen by Mr. H. W. Shepheard-Walwyn shows that the British otter can make, use, and appreciate a good mud slide. The writer describes how by the side of a lonely back-water of a river near Oxford he discovered an otter's holt, and not far from it was puzzled to observe "a kind of natural hillock seven or eight feet in height, from the summit of which a smooth well-beaten track about two feet wide slanted down to the water, where it terminated abruptly." To solve the mystery, he returned at sunset and climbed into a big willow overlooking the otter's holt, whence he soon had a view of a big dog-otter, which gave a whistle, when several cubs came out of the hole. "Father's signal had its effect, for the whole family were on the spot in what seemed like the twinkling of an eye. And then ensued an exhibition as comical as anything one could meet with outside of a circus.

"With an excited cry of anticipation, a wet, slippery figure made a sudden dash for a cleft in the bank, just beyond the mysterious hillock, the

rest of the party following close upon his heels. Up the bank they scrambled pell-mell, with a chorus of hysterical noises, shoving each other like children in their anxiety to reach the summit first. Father won by a good length, and, folding back his fore-paws, threw himself flat on his chest, and down he went head first with a smooth clean slide into the water. His mate followed suit, and then came the children, patting and scratching each other like kittens in their eagerness to take off first. These, however, were obviously not such old hands at the game, for one young rascal missed his course the first time, and rolled ignominiously over the bank at right angles with a highly unorthodox flop into the water.

". . . the whole family turned, and with one accord dashed up the bank again. And again—and then again—and yet again was that ridiculous performance repeated. . . . The youngsters had got well into their stride by now, and were shooting down that twenty-foot toboggan track as neatly as the old dog himself, their glistening wet bodies skimming over the ground as though they had been well oiled for the purpose. Each, in striking the water, turned with the same precipitation, and tore up the bank with such haste that the slide seemed to be never without an occupant, and the whole proceeding put me in mind of the merry-go-round at a fair." (*The Spirit of the Wild*, 1924, p. 23.)

Could any description better this for conveying an impression of fun, of amusement undertaken by young and old together for the sheer joy of it ?

THE RAVENS AND THE CAT

1. "Ben ruffles his feathers and takes the cat's attention"
2. "Joe about to seize her tail"

Returning for the moment to birds, and to the crow family in particular, the *Corvidæ* seem not only imbued with the sense of fun, but to have an especial appreciation of a practical joke, and the following account of a tame magpie, kindly supplied me by a correspondent, shows the same practical joking spirit evinced by the ravens: "A magpie called Jack," says his owner in a graphic description, "had the keenest sense of fun I've ever known in an animal. One day two dogs were begging whilst I threw them biscuits, when Jack, chortling to himself, came out of the bushes, and with his head on one side crept up behind the dogs and pulled first one's tail and then the other's. The outraged dogs turned on each other, whilst Jack chuckled in the bushes. As soon as peace was restored, and the dogs begging again, Jack flew down and repeated the performance. After that no animal with a tail was safe, and my white Persian cat went in fear of his life."

The first time, no doubt, the magpie simply pulled the tails of the dogs out of pure mischief, and without any appreciation of what would ensue, but his owner stresses the fact that he watched, chuckling, the resulting fight, and repeated his tail-pulling as soon as peace was restored. Had a child been guilty of the mischief, we should at once say that he repeated it to see the dogs fight. I see no reason why we should not credit the bird with the same motive.

This chapter shows that not only do most young creatures play, but many adult mammals and birds

thoroughly enjoy some fun, and display an impish intelligence in their mischief, which illustrates well that the "man at the wheel" is very much in control of the machine, and that their actions are indeed animated by purpose.

CHAPTER VI

REVENGE

NO creature can bear another a grudge, and take vengeance for the wrong, whether a real one or only a fancied one, unless it be possessed of very considerable powers of memory and intelligence. The longer the time that elapses between the affront and the revenge, the greater we must conclude the memory of the avenger. Many anecdotes bearing on this point must, however, be received with caution, for few can resist improving a good story, which soon becomes worthless as evidence of fact. Yet allowing for this, allowing for the embroidering of the story-teller, enough remains for us to be aware that many of the higher creatures can not only entertain likes and dislikes, but will punish those whom they dislike, who have wronged them or interfered with them.

The elephant is notorious in this connection; many are the stories told of its long-nursed grudges, and how it has taken revenge years after. No doubt there is some exaggeration in many of these stories, but I witnessed an episode at the Zoological Gardens, Regent's Park, which showed considerable

ingenuity on the part of the elephant. Two soldiers were offering one of the elephants, standing in its stall in the elephant house, a bun. They held the bun out, but when the elephant passed its trunk through the bars and tried to reach it they drew the bun back again, which was repeated several times. The boys—for, despite their uniforms, they were little more—laughed hugely, especially when the elephant turned away, as if in disgust. It crossed its stall to where, in the corner, there was a water tap, from which water was slowly dripping. Putting its trunk to this, it stood and waited, collecting the trickling drops. The two soldiers were still there, with the bun, when the elephant swung round, walked back to the bars and blew the contents of its trunk over them ! The water went into their eyes and ears, and down their necks ! The elephant stood swaying its trunk and watching them as they decamped.

The whole episode showed considerable thought on the part of the elephant, and no one could doubt it was a deliberate revenge on its tormentors. Certainly it was a case of those who laugh last laugh the longest !

A similar direct revenge was that of the raven. The bird in question was Joe, the tame raven already referred to. To test his powers of discrimination I offered him first some bits of butter, for he was very fond of butter, and afterwards a bit of soap, the piece being similar in size, colour, and texture to the pieces of butter. He took the butter off my hand, picking it up gently and care-

fully, and even removing any scraps left behind—all so delicately you could not feel his powerful beak passing over the skin. Then I produced the piece of soap. He looked at it, did not touch it, but gave me a punishing peck on the finger. His great beak left a mark, the mark of his displeasure at being offered noxious soap instead of good butter! I was quite satisfied regarding his powers of discrimination.

Another instance of well-merited punishment being inflicted was the thrashing administered by a gander to a turkey cock. The gander's harem, namely, three geese, were rearing families of goslings, which "Frank," the gander, took a fatherly interest in, driving off everything, and everybody, that approached, or threatened to interfere with them. There was also a fine white turkey cock, a gobbler who strutted about as if filled with his own importance, and conducted himself in an overbearing manner towards the rest of the farmyard inhabitants. Frank took no notice of him as long as he did not interfere with the goslings, but the gobbler could not leave them alone. He was seen strutting at them and trying to drive them. Several times he was seen interfering with them, but later a fearful din was heard. We found Frank holding the turkey cock by his neck wattles and beating him with his wings. Anyone who has had a blow on the leg from a gander's wing will know what this means. The combatants were parted, but the turkey was already bruised from head to foot. He was not only bodily punished, but his

spirit was broken; he strutted no more, and just moped about the farmyard, until at last the edict went forth that he should be slaughtered.

Somewhat similar was the fight between the peacock and one of the farmyard roosters, though in this case the aggression was direct, and not through the family. The peacock was feeding peacefully on a rick under a Dutch barn, when a fine and very cheeky young Wyandotte cock flew up, stood in front of the peacock, lowered his head, put his hackles up, and sparred at the peacock. The latter regarded him quietly for a moment or two, then his head shot out in the lightning quick lunge of a peafowl, and the cockerel received a blow on the comb that sent him reeling. So hard was the tap that impudence was thoroughly punished.

Peafowl are very resentful of interference, whatever form it may take, and I had the good fortune to see the beginning of a feud between a peahen and a cat. The former was being fed with bits of bread and scraps of meat, of which peafowl are exceedingly fond, when the household cat came up and tried to snatch a piece. The peahen stepped sideways towards her—a sure sign the bird meant mischief—but the cat did not give ground. A moment later, however, she was fleeing, having had a shrewd peck on the nose. Since then, and at times when there is no food about, I have repeatedly seen that same peahen stalking the cat, sidling up to her, to give her a peck, or else fly over her. The cat now bolts whenever she sees the peahen coming towards her. Previous to the food-

stealing episode they had been quite indifferent to each other.

Old Hooter, my pet brown owl, had a feud with the housemaid, which originated through the girl driving the bird off a favourite perch. He used to roost on the curtain pole in the sitting-room, but one day, when the maid wanted to turn the room out, she took the broom and swept the owl off his perch. Next day, when the girl was going through the hall, Hooter dropped on her head! As Hooter, with his downy plumage, flew absolutely silently, the attack had all the force of a surprise. How the girl screamed! The worst of it was that the old bird was not content with his triumph, but ever after persisted in flying at every white cap he saw coming, swooping over them, and then flying off hooting loudly. With his friends his manners continued as perfect as ever—at least until the day he mistook my father's bald head for a white cap! That finished Hooter's revenge; he was henceforward exiled to an outbuilding.

Many animal feuds, and cases where horses, cattle, dogs, etc., have taken sudden dislikes to persons could, no doubt, be traced to similar causes—to some annoyance or injury, especially injury to their young. Where all the facts are known, we invariably find good cause for the hate, and my experience is that there is no such thing among animals as "unreasoning dislike." For instance, an old sow conceived a violent antipathy to a man whom she saw occasionally: inquiry revealed the fact that he had hurt within her sight and hearing one of her

piglets. It was months before he dare venture into her sty, as she went at him open mouthed.

These instances of "revenge" seem to me especially good examples of purposeful action, of actions that could not have been performed save under the guidance of a mentality akin to our own, which is why I have placed them in a chapter by themselves, so that their full significance may be appreciated by the reader.

CHAPTER VII

RAGE

THAT animals, like ourselves, are subject to fits of passionate emotion is a fact that all those who have had dealings with animals, whether wild or domestic, are only too well aware of.

Creatures vary much in temperament, both specifically and individually, but they are few indeed that do not exhibit anger and annoyance now and again. It is not so much the fact that animals are liable to become enraged, as to why they should become passionately annoyed, which concerns us here—why two robins should fight with all the fury their little beings are capable of, why a dog should snarl in anger at the sight of a stranger, why two shrews, meeting for the first time, should fight to the death, why stags engage in mortal combat, and last, but not least, why herd and pack animals should now and again turn upon one of their number and do it to death.

Anger is undoubtedly often due to territorial trespassing. In the chapter on "Territory" the great position it occupies in animal life is pointed

out. A great many mammals and birds have their domicile and hunting-grounds, and look upon the area they are accustomed to work over as their own; not only is "possession nine points of the law," but, like the "Englishman whose house is his castle," they are prepared to fight furiously to keep out intruders.

This is the attitude of our friend the dog, probably founded on an age-old instinct, inherited from the period when the dog was a wild hunter running in a pack, when the survival of the individual and of the pack demanded the keeping of rival packs off the hunting-grounds. It is no longer a matter of survival value to the dog that strangers shall be kept at a distance, but the sight of a strange dog and, through the transference of the pack allegiance to man, the sight of a strange man, will act as a stimulus that releases emotion and produces in that dog's mind the sensation of hate. It is probable that the dog who lies sleeping on the garden path in the sun and, roused by footsteps on the gravel, jumps up to see a strange dog standing there, does not stop to consider that here is a new-comer and therefore it must be evicted, but just feels hate surging through him—hate of the stranger because he is strange, and because he is on his own garden path. Filled with righteous anger, hair bristling, our dog rises to his feet, stands very erect on legs as stiff as rods, lowers his head, lifts his lips to bare the canines (this lifting of the lips in moments of anger is, despite the efforts of taxidermists to make us believe the contrary,

confined to the dogs, wolves, foxes, and their relatives. Taxidermists are fond of setting up all species of carnivores in an open-mouthed, snarling attitude, which is quite unlifelike in most cases), and utters a deep, menacing growl—a "get off my ground" that has instant effect if the intruder is only trespassing by accident. The latter will then back discreetly away, and beat a hasty retreat down the road. But if it is no accident, if the intruder means to stand his ground, they fly at each other's throats with but little more ado. There may be a slight preliminary, a few stiff-legged paces around each other, while their bristles rise higher than ever, but with real intention animating them, with rage filling their beings, they do not waste much time.

Such is the origin of many a dog-fight; but there are others, especially between old comrades, that have no such cause behind them. Sometimes it would seem as if they fought for no reason at all, save love of a scrap, yet if we watch and analyse dog behaviour we may get some clue to these outbursts of rage. Jealousy is a potent source of trouble. I knew well two little bitches—the one a smooth-coated fox-terrier, the other a Skye terrier —that were intensely jealous of each other. They had lived and hunted together for years, but hated each other none the less. Pat one, or give her some food, and Number 2 would fly at her like a little fiend. Take Number 2 on your knee, and you would see the other eyeing her with smouldering rage, and only waiting until she got down to go

for her. That both died " in their beds " was luck, and no credit to each other.

Jealousy is as potent a source of trouble in animal life as in ours, and by jealousy I do not mean only jealousy at mating time and combats between rival males, when, of course, rage and hate burn at their very fiercest, but ordinary jealousy of one another under ordinary conditions. Take Moses, the old female otter, and Tom, the young dog-otter, as examples. Tom was only a small cub when I got him, quite helpless and unable to defend himself; Moses was two years old, very tame and devoted to me, and of so amiable a disposition that I never thought she could be really nasty to the cub. Yet the first time she saw him, when I was holding him in my arms, she gave a furious growl, sprang up, and tried to seize him. I dropped the cub, grabbed Moses, and administered a sound shaking —there was no doubt she would have killed him if she could have got hold of him. I was very anxious to get her friendly with him, but it was many weeks before she was reconciled to him, though, from the first, little Tom was only too anxious to go to her, squeaking and whimpering most piteously at the sight or smell of her. Whenever she saw him in my arms her anger was redoubled, and her growls were a treat to hear. That she resented my attentions to him was obvious, and I have little doubt they would have become good friends much sooner but for her jealousy—not unnatural jealousy, considering she had enjoyed my undivided attention for over two years and

now found me bestowing part of it on a newcomer.

Otters, though normally the most jovial and light-hearted of creatures, can and do lose their tempers at times. Once, and once only, did Moses show me temper. She had been playing on a pool, and I wanted to catch her and take her in, and was following her round the banks in an endeavour to pick her up. I made a grab at her tail, but missed it as she dodged in the water. To my surprise, instead of swimming away, she came back, climbed up the bank, and with that sharp cry "Quack!" which denotes great annoyance, made in her turn a grab at me! The measure of her anger can be gauged by the fact that she was perfectly indifferent to being handled and was accustomed to being seized by any, and every, part of her body. It was sheer temper at being interfered with when engaged in frog-hunting, and in her case was a unique display of rage.

Tom, the dog-otter, has rather more often lost his temper, for I have known him display annoyance several times, and once he really fell into a rage. He had got a large earthworm, which he was playing with, and tossing about, preparatory to eating it, when I put my hand on his neck. Whether he considered the worm an especial treasure, and thought it was going to be taken from him, I cannot say, but he dropped it, and jumped round in a perfect fury, springing at me, growling savagely. He stopped short when he found who it was, but seemed thoroughly upset for some minutes afterwards.

As showing the difference in temperament, and how much more easily some individuals are roused to anger than others, I must mention that Aaron, Moses' sister, bitterly resented being handled, and would fall into a paroxysm of fury if seized unawares—fury, not fear, be it noted!—at least if seized by any other part than the loose skin at the back of the neck. If picked up by that, she did not fight, but collapsed at once. This seems to be a survival of an instinct inherent in the young cub. This is the part by which the dam carries her cubs if she has to move them. She bears them by the "scruff" of the neck, and the little things hang limply and unprotestingly in her jaws. When full-grown animals—I am speaking not only of otters, but of other species as well—find themselves gripped in the old way that their mother used to carry them, they no longer attempt to fight, but hang limply in their captor's hands.

Now Tom does not mind being picked up in the least, as long as he is not grabbed at, but he is quickly roused to resentment by a sudden snatch of an inconsiderate hand. For instance, if pulled up short by the tail he will snap at the aggressor; but can we be surprised at any creature being moved to annoyance if treated so cavalierly?

That insult and interference should be resented is but, after all, what we should expect from a creature showing any degree of intelligence, and the otter, as mentioned elsewhere, shows a very considerable meed of it.

With the lower animals rage, as a rule, is a fleeting

emotion, like "April showers that pass with varying shadows o'er the grass," but the cases of revenge given in the previous chapter show that in some animals anger does not evaporate so quickly. The elephant that had been teased by the soldiers took over five minutes to collect enough water to retaliate upon them; and in the case of the owl that had a feud with the maids, his anger was rekindled each time he saw a white cap. When the two otters, Aaron and Moses, fell out and fought, it was over twenty-four hours before they quite recovered from the effects of their rage. The trouble was over an eel, which a kind visitor brought for the cubs, as they were then. Though at first very frightened of the squirming, slimy monster, so frightened that they would not touch it, they must eventually have tackled it, for when on the following morning I went to their place to see how they had got on, I found the eel partly eaten and two thoroughly upset otters—upset, that is, as regards their tempers. It may be as well to quote at length the description of this quarrel that I gave in my book, *Waterside Creatures*:—

"On opening the door," the morning after the otters had had the eel, "out darted Moses; but what a Moses she was! She appeared like a very much drowned rat. She was wet and dirty, and looked as if she had been dragged through a bush backwards. She ran to me, rolled on her back between my feet, and squeaked most piteously. Through the open door the eel could be seen with its head eaten off. I jumped to the conclusion that

she had eaten too much of it, that it had disagreed with her, that she was in dreadful pain, and going to die. I sat down on the grass, and the poor thing came to me, crept under my petticoats, and cried more piteously than ever. It was most distressing not to know what to do for her, and it was evident that she was very bad, but I was somewhat relieved to find that when I moved she could run after me, though it was only to seek refuge again under my skirt. Aaron, too, looked somewhat dishevelled, but she did not whimper like Moses, yet there was something wrong with her. She did not come near me, but kept at a little distance, circling round in a doubtful manner, but whenever Moses caught a glimpse of her she rolled on her back again, crying more piteously than ever. I got the invalid upon my knees, but she would not stay, creeping under the shelter of my overall, whence she peeped out, a most miserable and woebegone object. I wondered if she was too ill to eat, and feeling in my pocket, found a piece of cake, of which I offered her a bit. She took it, and then catching a glimpse of Aaron, gave a whimpering growl, at the same time bolting the cake. Another piece of cake was eaten equally readily, but every time Moses caught sight of Aaron she growled at her. Then it dawned upon me what the real trouble was—they had quarrelled! They had fallen out over the eel, and had had a real sisterly scrap. 'I will soon make sure,' I thought, and went off to find some rabbit meat, Moses following as if glued to my heels, while Aaron went down to the pond to bathe. The meat

BELLI ZEBINA

was taken as greedily as the cake, she crunched it up without loss of time, and my fears vanished as I watched her chewing steadily. She was quite all right, the only damage done having been to her feelings and dignity, for when I played with her and rolled her over I could not find a mark or a scratch ; she was not even bitten—it was evident that the eel had not agreed with the temper of the two otters !

" On returning to the pond, where they met again, there was more chattering, squeaking, and growling, and no signs of forgiving and forgetting. At last I shut Aaron up and took Moses for a long walk, keeping her out for an hour or more. On returning Aaron was released, whereupon the two otters lay down upon the grass and faced one another, both giving little sobbing squeaks. For two or three moments they lay thus regarding each other, then simultaneously jumped up and moved a pace nearer, paused and eyed each other doubtfully, and then rushed together, put their paws round each other's neck and rolled hugging on the ground. But even as they rolled together one or the other gave a little sob. They jumped up and went off to hunt in the pond together, but though they had, as the children say, ' kissed, made friends, and forgiven,' they had not forgotten, and Moses especially gave a little convulsive sobbing squeak now and again. They were not quite themselves all day, their games lacking the usual heartiness ; indeed, it was two days before the affair was absolutely forgotten, and they played together with their accustomed joy and freedom " (pp. 60–62).

Now in contrast with these otters, that were only angry for some good reason, whether with each other or with me, I must give the case of a wild-cat kitten (*Felis silvestris*) that I tried to tame. The true wild cat is reputed untamable; it is supposed to be the wildest and fiercest creature of its size in existence, and after my attempt to make friends with Beelzebina, the Princess of Devils, I fully endorse this. By much patience I succeeded in overcoming the fear of man, but never did I see a creature subject to such angry outbursts. To touch or handle her was quite impossible: she would take cream from a spoon, licking it up like any household tabby while you held it in front of her, but move so much as a finger towards her, and she would aim a savage blow at your hand, at the same time spitting like a soda-water bottle going off. To test how far these demonstrations were the outcome of dislike of the human species, I got the household cat, a meek little female, and held her by the wild cat's cage. Out of her bed sprang Beelzebina, flung herself against the wire, and dashed down the cage in a vain attempt to follow, when the terrified house cat sprang from my knee and fled from the neighbourhood of the fury. A large tom-cat was then requisitioned and turned in with Beelzebina. She sprang at him too, clawed him on the nose, and provoked him to retaliation. He hit back, and with such good will that the little devil did not repeat her attack, but sat glowering at him from a corner.

Her conduct has been described to show that

some creatures are much more easily enraged than others; that some only become annoyed when really provoked, and others are liable to paroxysms of fury for very little reason. They are like a pot nearly at the boil, and ready at any instant to boil over.

So far we have been considering ordinary outbursts of rage; anger at territorial trespassing; anger at aggression, interference, and teasing; and anger arising from quarrels over food; but there is another class of angry emotional outburst we have not yet touched upon, namely, the way certain pack and herd animals will sometimes turn upon one of their number, and, in what appears to be a storm of fury, do it to death.

With rare exceptions, fighting in all species is only between male and male, and female and female. Sex, for obvious reasons, does not battle with sex. The only exception I have known were two spaniels, a dog and bitch, brother and sister, that fought like fiends on the slightest provocation, but in well-bred, otherwise inbred, domestic animals, we often get mental degeneracy—I have known dogs that were quite idiotic. But in these inexplicable episodes when a herd, pack or flock, falls upon one of the members, all the individuals, irrespective of sex, go for the offender. I use the word "offender" merely to designate the one in trouble, and without the knowledge of whether it is actually guilty of anything, though, as I will presently show, there are grounds for thinking that offence has been given.

Hudson dealt with this curious problem in his *Naturalist in La Plata*, instancing the way cattle will sometimes turn upon one of the herd. He attributed it to a misleading perversion of the mutual helping impulse, the instinct that makes the social body combine to help and defend each other when danger threatens. He thought that the sight of one of their fellows in trouble of any sort roused the same emotion and rage as that which enables them to face an antagonist, and so swept them off their feet that they blindly attacked the victim.

But this ingenious theory, though it may rightly interpret the behaviour of herds of cattle on the plains of La Plata and the Argentine, does not explain any of the instances that have come under my notice, for the simple reason that the victim of the attack has been in no previous trouble.

I have known of four instances of a pack of fox-hounds falling upon individual hounds when out hunting. All four victims were bitches, and of these three were litter sisters.

The first attack took place at the end of a day's hunting. The pack was proceeding homewards, when a member of the field asked the Master to stop and have some refreshment at his house. While the Master was doing so, a bitch that had been left behind came trotting up to rejoin the pack, advancing towards them with stern erect and her hackles up—such manifestation of emotion is quite usual when a member of the pack has been away and rejoins it. She was greeted by what is also usual on such occasions, namely, a few throaty

growls. As a rule the matter ends with that, but this bitch seemed to be intimidated by her reception, and turned away, tucking her stern between her legs, preparing to bolt. Three or four of the nearest hounds sprang at her, and in an instant the whole pack was pouring after her down the lane, bowling her over within a few yards, so that in less time than it takes to tell she was the centre of a seething, raving mass of furious hounds. It was with the greatest difficulty that Master and whips beat off the aggressors and rescued the bitch alive, but much damaged, so damaged that she subsequently died of her wounds.

It seemed as if she offended her fellows by jaunty and impudent behaviour, then got frightened, and bolting brought into play not only the impulse to hunt that which runs, but the bullying instinct so prevalent in all creatures from our schoolboys downwards.

The second episode of this kind was when a sister of the bitch mentioned above was attacked in kennel, and nearly killed, but no one saw the beginning of this fracas.

The third instance, also a sister from the same litter, was at an earth in which a fox had gone to ground. Hounds were baying round it in a great state of excitement, when a hound that had been left behind came up, and the others set upon her. It was with difficulty she was rescued. Again, as in the first case, the bitch coming up "showed cheek" to her fellows who had arrived previously, and was immediately attacked. But I did not see

her make any attempt to run off when they turned upon her.

A fourth case, almost exactly the same as the above, except that the victim was unrelated, can be added to the list of these pack attacks on single hounds. In this last case the bitch was so badly hurt that she died. I was a witness of two out of the three episodes that took place in the hunting-field, but not of that which happened in kennel. The information with regard to the latter was supplied to me by the kennel huntsman, a reliable and intelligent man.

Horses, which in a state of Nature would be herd animals, seem also to be liable to these paroxysms of herd rage, for I have known instances of several individuals combining to attack another. The worst case was that of three thoroughbred brood mares, turned out together in a field. For no reason, so far as we were aware, two turned upon the third, and after driving her about the meadow, got her into a corner, and eventually down in a ditch, wherein, but for timely aid, they might have killed or gravely injured her. They were biting, kicking, and screaming like furies.

I have heard stories of social birds, such as rooks, likewise falling upon one of their number and slaying it, but have never had the good fortune to witness such an occurrence.

The great distress that the smell of blood causes cattle and horses, in which fear and anger seem mingled, may sometimes come into play in these attacks on members of the herd, but it must be

remembered that in the cases mentioned above the victims were in the best of health and condition when attacked. They were not in any way injured. Nevertheless, nothing so thoroughly upsets horses, and likewise cattle, as the smell of blood. I have seen horses stand snorting by the spot where a comrade had been slain, despite the fact that every effort had been made to cover up and hide the gore with soil; and cattle came up, to likewise snort, and then paw the ground, and bellow, giving a low menacing roar of fear and rage. For days both horses and cattle came to visit the spot, each time displaying the same emotion and disturbance. As these placid Hereford cows, and equally placid farm horses, had none of them any experience of blood, or could have had any conception of its meaning, we can only attribute their excitement, which was intense, to a truly instinctive reaction—an instinct which in wild creatures is probably very useful, bracing the herd up to do desperate deeds of defence when attacked by predatory animals.[1]

It is a far cry from the almost insane outbursts of rage in herd animals that we have described above to the combats between rival males, and sometimes females, in the breeding season. These fights frequently have an air of "make believe" about them; they seem to be rather an outlet for overflowing excitement and emotion than real duels *à l'outrance*. Take, for instance, two cock pheasants sparring on a spring morning. A glorious sight as the sun glints on their resplendent plumage and dilated scarlet wattles, they manœuvre about one

[1] See note p. 94.

another, with lowered heads as if looking for an opening, make feints of flying up into the air, only to fall back and eye one another again. So they will go on for many minutes, but nothing serious happens, not even a feather being shed, and eventually something disturbs them which stays the duel, and away they run.

Then take the spring combats of "mad March hares," when the Jacks prance about, rear up on their hind legs, and box at each other with their forepaws, at the same time manœuvring for an opening when one or the other may be able to bound over its foe and deal it, as it does so, a blow with its powerful hind feet. It is seldom, however, that any harm is done; it is rare even for the fur to fly; the combatants get rid of a vast amount of superfluous excitement as they revolve about each other, and probably thoroughly enjoy the affair, and eventually break it off with neither side "one penny the worse."

Nevertheless a creature like the brown hare can rise to heights of very real anger, as I discovered in the case of my pet male hare called Topsy. He was quite fearless of people he knew, and perfectly domesticated, having the run of the house. He often came into the sitting-room, but if compelled to stay longer than he chose he invariably "showed temper." If you got between him and the open door, he immediately uttered a little grunt, reared up on his hind legs, and struck at you with his forefeet, hammering with lightning blows on skirt or trousers, as the case might be, and the more

one laughed, the more furious he seemed to get. In the same way he would attack a closed door which he wanted to pass through, not, apparently, with any idea of scratching it down, but in sheer anger at finding his passage barred.

Returning to the joyful battles of the spring, scraps undertaken in the joyous abandon of the season, we find every grade in these affairs, from the pleasant duels of passerine birds like thrushes, when one male flies at another because the latter has passed across his territory, to the really grim territorial battles of moorhens, of which more will be said later.

With regard to spring duels being more or less emotional outlets, it should be noted that Jack, the tame thrush, loved sparring with me when in full song. I had only to crack my fingers and point at him for him to respond by lowering his head, laying down his feathers, making a cracking noise with his beak, and then fly at and peck me—he could peck hard, too! Once the breeding season was over, he had stopped singing, and begun to moult, it was only with much trouble that one could rouse him to the fighting pitch. He might give one a peck or two, but there was no longer "any fun in it."

Examining the evidence with regard to breeding-season fighting, we find every grade of angry emotion, from the furious and deadly battles of the carnivores to the far less serious combats of hares, and in birds from the angrily purposeful duels of moorhens to the more or less mimic fray indulged

in by many passerines, to say nothing of the playful tournaments of the blackcock. In the latter case, and likewise in that of the ruff, the birds assemble, usually at break of day, on a chosen spot, and there display and engage in mimic combat, to the, we may hope, edification of onlooking hens. The blackcock on his tourney ground, and the ruff on his fighting hill, are not animated by any real fury and hate of the rivals with whom they spar, but by the joyous overflowing emotion of the season, which excitement serves to rouse similar emotion in the hens, and enables them to win their mates.

From the joyous duelling of the spring to the mother, whether bird or beast, that defends her young would seem but a step; but it is a wide step! There is little in common between the usually light-hearted scrapping 'twixt rival males and the indomitable self-forgetting fury of the female whose offspring are threatened. She knows no fear in the defence of her babies—fear, so closely akin to fury, is transformed into it. That a rabbit should ever turn upon a stoat would seem impossible when one remembers the paralysing fear that numbs a rabbit pursued by one of these little hunters. I have again and again seen a hunted rabbit sit down and wait, without trying to save itself, for the stoat to come up and kill it. Yet the following three cases show how when one emotion fills the mind of an animal like the rabbit, it is to the exclusion of all else, especially of personal fear.

The first case was observed by my father, Mr. W. J. Pitt, a keen and critical observer of

animals. He was out one spring evening near a spot where numerous rabbits were feeding, and was walking along so quietly that they did not heed him, though he had approached within thirty yards of the three or four nearest ones, when, to use his own words, " they pricked up their ears and looked towards a bush. There was a rustling, scuffling noise, and out came a big stoat, followed by a rabbit. She did not give him a moment, but, jumping over him, dealt him a sharp blow with her heels. He hissed and swore and tried to get away, but she went after him, and hit him again and again before he could get under some dead bracken. The other rabbits sat up and watched, and not one ran away."

The other two accounts were given me, the one by a schoolboy and the other by an old workman, each within a few minutes of the occurrence, and with a wealth of vivid detail. The latter described how a large stoat came out of a rabbit burrow carrying a small rabbit (" a little wee rabbut "), followed a few paces behind by a rabbit, which sprung over the stoat, striking it on the back with her hind feet. The stoat—no doubt considerably startled !—showed no fight, but dropped its victim and bolted into the bushes. " But the little 'un was dead, bitten through the back of the neck," said the old labourer; adding, in answer to my query, " No, nothing more happened; I didner see no more."

The third occurrence was in a different place, and was seen by a lad, who ran for me to come and see the end of the episode, but when I got there a small

dead rabbit, bitten in the back of the neck, was all that there was to be seen. This boy's account was similar to that of the old man, and I have no reason to doubt the accuracy of either of them. We know that doe rabbits do not lie with their young, but in these cases they had evidently been within hearing.

Then take the way some birds will try to drive the intruder away from the neighbourhood of the nest, even striking him in their desperate fear for their young. The tawny owl is one of the bravest birds I know in this respect, and I have been attacked, quite fiercely attacked, by a female whose nestlings I was inspecting. Swooping down, as I stooped over the owlets, on noiseless wing, so that I never heard her coming, she hit me forcibly and, needless to say, in a very startling manner, in the middle of the back. As I straightened myself I received another blow on the head. The Arctic and great skuas, those robber gulls of northern seas, often attack human beings when the latter are near their nests, swooping down on the trespasser with whistling wings, to hit him with their feet as they pass over. A friend who was looking at young great skuas with me on the Island of Noss (Shetland) received such a blow from one of the irate parent birds that she had a sore cheek for days afterwards. We were not actually touched by the smaller species, namely, the Arctic skua, though the birds drove at us with much vim, and the Shetlanders said they were really the more pugnacious of the two. This we could well believe when we

saw with what determination they attacked dogs and sheep, and with what overmastering excitement they seemed filled at the sight of an intruder, whether animal or human.

When we consider how temperamentally timid most birds and beasts are, when we consider how universal is the fear of the unusual (otherwise man), and what a powerful instinct is the impulse to flee from the unexpected, it gives us some measure of the force of the mother's love for her young when we see her thus turning upon the foe in their defence. The marvel is, not that many creatures cannot achieve these heights, and flee, as usual, from an enemy in panic, but that any individuals can overcome their great fear for the sake of their little ones and then turn upon their worst foes. The fury that then possesses them is more overpowering than the frenzy of a maniac—take the cat which flies at a strange dog when it ventures near her kittens, or the hen which turns upon dog or cat in defence of her chickens. Both are temporarily transformed into self-regardless fiends! It would seem that they are so filled with rage and hate that they have no room for fear—but they generally instil it into the foe! I saw a small bantam hen, which had some tiny chickens, when one of my otters ran after the chicks, put the otter to rout, flying at it with such fury that the attacker fled on the instant.

In concluding this chapter it must be pointed out that in marked contrast to the subject last discussed, namely, "Revenge," "rage" drives us to

the conclusion that the actions of animals when animated by anger are more instinctive, and less purposefully intelligent, than when they are not run away with by their emotions, but that the degree to which they lose control of themselves differs greatly in different species and in different individuals of the same species. Certainly rage in animals, as in us, is a powerful emotion often leading to very strange results.

NOTE.—With regard to the behaviour of horses and cattle when confronted with the smell of blood, as described on page 87, it should be noted cattle in the slaughter-house and horses in the knacker's yard usually betray little excitement or horror of these fatal places, but then it is probable that the strangeness of their surroundings, and the conflicting odours, render them less susceptible to blood smell than they would be at home.

CHAPTER VIII

DESTRUCTION OF YOUNG BY THE MOTHER

PERHAPS one of the most extraordinary things in Nature (I shall presently qualify the use of the word "Nature") is the destruction of her young by a mother. Those who have had dealings with wild and even some domesticated animals know that it is not unusual for the dam to turn upon her newly born young and kill them, but such a thing is usually the result of interference or something that alarms and upsets the mother. Even the more domesticated creatures, such as the pig, are not immune from what seems to us a most horrible and unnatural perversion of the maternal instinct. Sows, especially young ones having their first litter, are liable to turn upon their tiny piglets and with a munch of their great jaws kill them, afterwards consuming the carcasses. Domestic breeds of the rabbit—to turn to a very dissimilar animal—are notoriously liable to destroy their young. Every boy who has kept pet rabbits knows that the does must be kept quiet, and free from disturbance, not

only at the critical time, but for several days after.

Instances of the killing of the young by their dam in the following species have *come under my personal notice*: badger, ferret, hedgehog, dormouse, rabbit, meadow vole, and pig—very diverse creatures, showing how widespread is the impulse. We have the badger and ferret (*Meles meles* and *Mustela furo*), representing the order *Carnivora* and the family *Mustelidæ*; we have the hedgehog (*Erinaceus europæus*), belonging to the family *Erinaceidæ* and the order *Insectivora*; then we have the order *Rodentia*, represented by the rabbit (*Oryctolagus cuniculus*), belonging to the *Leporidæ*; the meadow vole (*Microtus agrestis*), of the *Muridæ*; and the dormouse (*Muscardinus avellanarius*), a member of *Muscardinidæ*; lastly, the order *Ungulata*, represented by the domestic pig, belonging to the family *Suidæ*, and descended, or partly descended, from the wild *Sus scrofa*.

These instances are only those that have actually come under my own observation, but I have been informed of bitches killing their puppies, and, of course, it is common knowledge that lions, tigers, panthers, etc., at our Zoological Gardens often destroy their offspring. But the instances given above are sufficient to show what a variety of creatures there are that, under special circumstances, may turn upon their little ones. What, the reader will naturally ask, are the circumstances which bring about such a horrible deed? To throw light upon them I will give the details of some of

A MOTHER HEDGEHOG AND HER YOUNG ONES

these happenings, taking the episode of the meadow vole first, quoting the account I gave in my book, *Wild Creatures of Garden and Hedgerow* (p. 279):—

"I had found a field vole's nest in a hayfield, and, more by luck than anything else, caught the mother as she ran out of it. With some difficulty—for she kept nipping my fingers—I got her into my handkerchief, after which I examined the nest. There were at least half a dozen naked blind pink babies in it. They might have been a day old, but were certainly not more, for the wee mites were only about half an inch long. If they were left where they were, they would certainly be killed, as they were right in the track of the men and wagon that kept going backwards and forwards, so I picked up the nest and family and took them all home." They were carried with great care, the nest and little ones being interfered with as little as possible, and put into a glass-fronted cage, "provided with everything that the old mouse could possibly want—grass, lettuce-leaves, water, and even a wisp of hay to make some fresh dry bedding. I sat down some way off to watch what the mother would do. First of all she washed herself carefully, then she went to the nest, in which the little ones were lying quite quiet and still, pushed aside the finely shredded soft covering and pulled out one of the babies. Before you could guess what was going to happen, she had given it a sharp bite and killed it. She murdered them all!

"What made her do it? Was it to save them from an unknown fate? Or was it wild fear and

excitement, so that she did not really know what she was doing? All I can say is that she acted perfectly coolly and collectedly, and appeared neither hurried nor flurried."

They were slaughtered, I must add, not by one well-directed bite, but by general bites about the body, and she went straight from one victim to the next until all were slain, and without regarding their little squeaks, little plaintive sounds that were soon stilled. The deed done, she began to wash herself, and then to eat grass. She would probably, judging by other cases, have eaten them, but, more than a little horrified at the coolness of the murder, I took the cage out of doors and let her run away into the long grass.

This was an exceptional case inasmuch as the whole thing was seen; in many cases the fatal deed is a matter of inference; the badger and her cubs is an instance. A female badger had come into my hands during the month of February, and suspecting she was in cub, I took every precaution to ensure quiet and privacy for her, even padlocking the door of the pigsty in which she had been placed. One day towards the end of the month small and tremulous squeaks were heard proceeding from the inner chamber, upon which I redoubled my precautions, keeping the key of the door in my pocket, feeding her myself, and only opening the door of the outer place to put the food inside. But the next day all was quiet, no squeaks were to be heard, and I feared the worst. Another twenty-four hours passed, still no sound, so I peeped inside—not a

trace, not a vestige of a cub was to be found. Even if they died a natural death their mother must have eaten them, and though there was no proof that she was in fact a murderess, I have but little doubt she was!

Very similar was the case of the hedgehog; she was picked up one evening by some children and brought to me, and I placed her in a rabbit hutch for the night, intending to turn her out next day; but in the morning there were some faint, peculiar sounds, which issued from a nest of hay that she had made in the corner of the box. I could see the old hedgehog lying in it and some small pale objects by her side (young hedgehogs are greyish at birth and are covered with soft milk-white spines, which subsequently darken and harden), but I did not attempt to see more, only putting some food and water near and withdrawing. She was left undisturbed until the next day, when not a vestige of a young one was to be found! They had as completely disappeared as if they had never existed, and, being far too helpless to move for themselves, it was impossible they could have moved elsewhere than into their mother's inside.

Almost identical was the story of a dormouse and her litter: the young ones were heard squeaking, or rather giving the faintest of gasps, overnight, and in the morning they had vanished. Young ferrets have disappeared from the nest with equal expedition and mystery, nothing being left to tell the story; but in two instances doe rabbits that had slaughtered their litters made a mess of the job, leaving portions

of the carcasses and one or two whole bodies lying in the nest.

In the case of the ferrets, and of the rabbits, the young animals were about twenty-four hours old at the time of the tragedy, and the murders followed on the heels of interference, on that of a too great anxiety to inspect the new-comers.

In all the instances given above it will be noted that the young, though referred to as newly born, were not literally so, their deaths, or at any rate their disappearance, taking place twelve to twenty-four, or even more, hours after birth. This negatives any idea that the actual event of giving birth to them confused or excited the dam. As is well known, many animals devour the placental membranes, and were it not for the delay noted above it might be thought that the worried mother had got confused between her offspring and the refuse from the birth that it was necessary to dispose of; but in all instances events seem to have proceeded normally, for some hours at any rate.

It may at this point be argued that these animals were not really murderesses, that their young had died, and that they disposed of the bodies in the only way open to them, by eating them. This is plausible, if not convincing to those who have been at hand when such a tragedy has taken place, and in the case of the meadow vole we know it to be quite wrong, for she was seen to slay her very much alive and quite healthy babies. Moreover, such a creature as the badger is not normally a cannibal, and when a cub dies under natural conditions it

is dragged from the earth and taken some little way off. I recently, when examining a big badger "sett," found the body of a small cub thrown aside. It was that of a six-weeks-old one, and had been drawn some distance from the entrance. I say that it had been drawn out, because it had not been lying there a few days previously, and was quite "high" when found, so any idea that it might have crawled out, got lost and died, was out of the question. It must have, judging by its condition, been lying in the hole for some days before it was pulled out; and I have known of other and similar instances, showing, as said above, that badgers do not normally eat their own cubs, even when they die a natural death.

Now, at the beginning of the chapter, I spoke of the killing of her little ones by a mother as one of the most extraordinary things in Nature, but added I should qualify the word "Nature"—now for the qualification! The qualification is that it is *not* natural. Under normal, natural conditions such a thing never happens (I except altogether the killing of the young by the male which occurs in some species now and again)—at least, not that we can find evidence of—and when we speak of an unnatural murder it is a perfectly correct description. When a mother animal slaughters her babies it is under stress of abnormal conditions, under pressure, as we have the best of reasons to believe, of great fear and anxiety. Take the poor little meadow vole whose case has been described; she had been disturbed by strange and monstrous sounds, accompanied by shakings and tremblings of the ground,

LOS ANGELES COUNTY MUSEUM
EXPOSITION PARK

so that her lowly world among the grass stems seemed about to fall in some great convulsion, for the sounds and thumpings of passing men, farm horses and wagons, must be fearful, more than fearful, to wee beasts living in the herbage. From this awfulness she fled, to be pounced on by something terrifically huge, held prisoner by a hot hand, then put into the cambric bag of a handkerchief held by that same hand—what were the fears, emotions, and feelings that passed through that little mind? One great overwhelming terror? A fear so paralysing that it left no room for aught else? Surely she must have been paralysed with horror?

Incidentally it must be remarked that shrews will die of fright, sheer fear and nothing else, when they find themselves captured, running round and round in unceasing activity, until they can go no longer, and at last release comes to them.

Then what must have been that meadow vole's emotions when she found herself put down by her family, with her own familiar nest, and food at hand, but all around so strange! It has been noted that she washed her face: voles and mice always do so after being in any way upset. Give a mouse a start or a shock of any kind, and, the alarm being over, it immediately washes its face. I believe the action to be quite mechanical—a sort of outlet for the emotion, and a steadier for its nerves. Now, in considering this vole's behaviour, we must remember that her little mind, accustomed to deal merely with the passing events of the moment, and her scanty memory stored merely with the tiny events

of the world that lives in the herbage jungle of the meadow, if, indeed, she retained recollection of past events for long, had no equipment to help her understand her position. She might mechanically eat the grass beside her, but with shock, and fear, and strangeness, she must be utterly distraught. That she knew the babies lying before her were her own young ones I cannot doubt; smell, their familiar odour, would tell her that. Their soft plump bodies showed she had nursed them lovingly to date; mother love, the overwhelming mother love that will drive a rabbit to fight a stoat, would be hers in full meed; and that little brain of hers could hardly look ahead and fear the future, or at any rate not as a definite thought of future, not as a definite conception of danger and evil. But can we deny her a generalized fear, and can we add that fear was for them? In her poor little distraught head was there a great desire to save and keep her babies? That, at any rate, is the way I read her actions, the picking up and biting them, in an aimless, not precise way, dropping them and picking them up again. I believe she killed them because she so wanted to make them safe.

In most of the cases mentioned the young ones have disappeared, been eaten, and completely demolished—this seems to be the consummation of the desire, the instinct to save the young.

In every case of slaughter of the young that has come under my notice the dam has been annoyed, frightened or worried; fear has come into play in each instance, as it does in cases of infant slaughter

in the human species—I am referring especially to the murder of their babies by unmarried mothers.

It may seem to many preposterous to draw any analogy between the girl who strangles her illegitimate baby, and the mouse that kills her litter of young ones, yet is it so preposterous? Both act under the greatest fear and excitement, and dread of the future, definite in the one, vague in the other, dread for their offspring and themselves, and both are the prey of the abnormal, of unnatural circumstances calculated to upset the balance of their minds. I would seriously say to those social workers who have to deal with girls of this class, it is more than probable or possible that such crimes may be attributed to the same fundamental impulse that governs the vole, badger, or other animal, for I firmly believe that the mind of *Homo sapiens* differs in degree, but not in kind, from that of his fellow-inhabitants of this world, and that analogous impulses may be found in the mouse and the unhappy girl with her unwanted baby.

CHAPTER IX

INSTINCT

INSTINCT is perhaps the most marvellous thing in Nature. Under its guidance we see the most complicated performances carried through with unerring precision. We see the young spider spin its snare, line by line, and thread by thread, according to the hereditary pattern of its species, either the marvellous geometrical design of the orb-weavers, the apparent tangle of the sheet-weavers, or some other long-recognized pattern; we see the young and inexperienced bird collect materials and make its nest with all the art and skill of the eldest, making a wonderful cradle of moss and lichens, of clay and grass, a platform of twigs, or a cup of fibres; or else fashion with its beak a hole in a tree or bank; or yet again scoop a hollow in the ground exactly as its ancestors have done before it for generations untold, each according to its species keeping to invariable and unvarying custom, a custom so ingrained in the individual that it performs it as mechanically as a machine, and, it would seem, with as little knowledge of what it is doing.

Instinct is unconscious, it is independent of the intelligence.

Instinct is the automatic response, which occurs without assistance from the conscious mind, to some stimulus received from without or within.

In its simplest state instinct is a reflex action, and as an instance of this, and of the effect of a stimulus from without, take the involuntary closing of the eye when an object is flourished near it. We blink without any conscious volition, we blink " without thinking."

There is a vast difference between this simple reflex and the most complicated instances of instinctive behaviour, such as we meet with in insects. Though this book deals only with vertebrates, it is impossible to write of instinct without a passing reference to the order *Insecta* and other invertebrates, for it is in them that instinct reaches its highest pitch of development, and in them we find the clearest cases of the train of instinctive behaviour being fired by the physiological state, such as the cocoon spinning of the caterpillar that is about to pupate, the behaviour of which is entirely controlled by the state of its growth and development. A particular physiological state initiates a certain sequence of actions, and so mechanical is the process, that if the larva is interrupted after it has slung itself up, and half woven its silken shroud, it cannot begin again, it is helpless, and there is nought for it to do but perish !

From certain unpleasant, but highly instructive experiments that various research workers have

carried out on frogs, dogs, cats, etc., we are aware that the cerebrum has little or nothing to do with a considerable number of actions of the nervous system, which are accurately co-ordinated and carried out without any help from the seat of consciousness. Frogs that had had their brain removed, and dogs and cats that had had the great nerve of the spinal column severed, could still perform many actions which are normally carried out automatically. Even decerebrated dogs—that is, dogs from which the cerebrum had been removed—could still perform nearly all the necessary actions of life, though they displayed no consciousness or understanding of anything whatever. (C. Lloyd Morgan, in *Instinct and Experience*, chap. iii.)

This digression is to emphasize the fact that instinct is entirely independent of consciousness (though it may be modified by it), and is really a peculiarity of the lower nerve centres. Instinct and intelligence may, and usually do, co-exist in the same creature; in fact, when we come to analyse our own and animal behaviour, we become aware that there is no creature so intelligent, not even ourselves, with our vast reasoning powers, that can claim to be exempt from it, or free from hereditary predisposition and impulses, let alone such reflexes as the blinking of the eye when an object suddenly approaches it.

While at the opposite end of the scale we find creatures so instinct-ridden that they are but automatons, with consciousness, if present, only there as a looker-on.

In another place I have spoken of the body as analogous to a motor-car, with intelligence as the man at the wheel, steering its course through life; and this analogy is a useful one to enable us to grasp how intelligence and instinct can co-exist and co-operate in the same being.

Before going further I must again emphasize that mechanical responses are universal in living organisms, and that there is no creature so highly organized, or so intelligent, that it can always control its action, or is totally exempt from doing a thing without knowing why it does it.

Not only do we exhibit simple reflexes like that of blinking the eye, but the human baby sucks as mechanically as any other young thing; while no one who has watched a crowd ebb and flow can doubt that there are forces at work, impulses, independent of the will of the individual. Then take our friend the dog: for all his alert brain he performs many mechanical actions, not one more automatic than the way he turns round and round before lying down to rest. No doubt the wild ancestral dog, or wolf, or whatever that ancestor was, made his bed in the bushes, and had to turn round and round, and scrape, and scratch, before he could excavate a comfortable "form." Still the instinct survives, and still the pampered pet, whether terrier, Pekinese or Great Dane, turns about, turns round and round on the rug before the fire, before it lies down. Then take the shying horse, that bounds sideways across the road from some small object—little bird, stone or piece of

paper, that we should never have noticed. Surely that sideways jump is a mechanical response, rather than conscious fear of something strange, for the horses that shy worst are those that shy at little and to us inconspicuous objects. A theory has been put forward that this habit is a survival from a period in the horse's history when it suffered attacks from predaceous beasts, when the slightest stirring in the leafy depths of a bush might be Death about to spring, and when the individuals that jumped aside survived to propagate their kind. This may, or may not, have been the case, but the suggestion fits remarkably well with the present-day behaviour of the horse, who will cheerfully and indifferently pass tractors and cars innumerable, only to bound quivering across the road when a little wren stirs, or a leaf shakes, in the depths of the fence.

Then again take as an example of instinct in intelligent beings the migrations of birds, whose terrific journeys will be dealt with at length hereafter, which travel at its behests over hundreds, sometimes thousands, of miles of land and sea, chiefly by night, to a destination of which, unless we are greatly mistaken, they can have no pre knowledge. Then, too, there is nest-building. Each cradle involves thousands of separate actions, yet the result is according to pattern, invariable pattern, that is as much specific, as truly typical of the species, as the length of its tail and wings, and the shape of its beak.

We find that the more specialized instincts are

not only wonderful sequences of complicated actions, but that these sequences are as much the peculiarity of the species performing them as most of the characters usually used to describe the bird or beast; and in the case of nearly allied species, of which scientists doubt the status, an investigation of their instincts, habits, and predispositions would help to settle the matter.

The older school of mammalologists held that the mouse we now call *Apodemus flavicollis wintoni*, De Winton's yellow-necked mouse, was but a large variety of the common long-tailed field mouse, *A. sylvaticus*, yet had they known that the latter never, or hardly ever, invades dwellings, while the former is very fond of doing so, they might have modified their opinions. We now know the two mice have cranial differences sufficient to ensure them being regarded as specifically distinct, but after a long study of these two mice I am convinced their physiological differences are not so great as their psychological ones.

We find that instinct depends for its performance on a stimulus, that acts like a finger pulling the trigger of a gun, and that in the case of the less specialized instincts this stimulus usually comes from without the organism. Many young animals display what appears to be instinctive knowledge of their food, and I have seen instances of this in a fox-cub and an otter-cub. The fox-cub, which came into my hands when twenty-four hours old, had been hand-reared, and had known no other food than milk from a bottle, until the day came

when, her teeth having appeared, I offered her some rabbit meat. This had been nicely skinned of fur and cut into strips. She dabbed her little boot-button of a nose against it, then turned aside as if disgusted with the clammy stuff. Again it was put before her, again she turned away, displaying no comprehension whatever of what the meat was, still less any desire for it. Feeling sure the fox-cub had reached the age when it was desirable she should eat solid food, I continued to put the meat before her, while she as resolutely turned her snub nose away, until I accidentally placed near her a piece of rabbit leg that had *some fur attached*. She smelt the meaty part with as little interest as before, until her nose touched the fur, when an amazing transformation occurred. The soft rabbit fur had acted as the trigger which, when pulled, released the instinctive knowledge that here was something to eat, something good. She growled like a little fury, at the same time seizing and shaking the rabbit leg. It was the first time I had ever heard her growl, yet now she was growling savagely.

I have said that the touch of fur awakened the knowledge that here was something to eat, but this requires qualifying : the response that the touch of fur really evoked was undoubtedly the impulse to grab, and worry, a furry thing, which she did most heartily, and when, biting the leg, she tasted the meat, and found it good, she began to eat it ; so the sentence should have run that she *behaved* as if she had become aware that here was something

good to eat. Henceforward she ate heartily, but never afterwards worried inanimate rabbit legs with the same gusto.

Almost identically the same thing took place with one of the otter-cubs (Moses), to whom I was offering a fish—a trout—for the first time. She took no interest in it, and would not touch the fish, let alone begin to eat, but when, having cut its shoulders open, I offered it to her again, and she smelt trout flesh, she made a grab at it, seized and shook it, growling angrily, just like the fox-cub. This time it was the flesh, the meat of the fish, that released the impulse, it being apparently the smell and feel of it on her nose that acted as the stimulus. Henceforward she too knew all about solid food, and ate trout and other fish most greedily.

An even clearer case of a particular stimulus producing an appropriate instinctive response was that of a young song-thrush when offered a bath for the first time. I held the bird, which had been hand-reared and was confidingly tame, near a shallow pan of water, which it eyed, without displaying any interest or comprehension of what the liquid was. So it sat for some minutes, taking no notice of the bath, and at last began to preen its feathers. At this, with my other hand, I began to ripple the water, not splashing it, but just making it ripple. Instantly the young thrush was all attention, gazing down interestedly into the pan. Again I gently rippled the water, whereupon it jumped from my finger on to the edge of the bath, hopped in, and began to bathe. It ducked its

head, spread its tail, fluffed out its feathers, and beat the water with its wings; going through all the motions appropriate to the rite of bathing as fully and elaborately as any experienced old bird. Yet I knew this was the first time it had ever seen water. After thoroughly wetting itself, it hopped out again, and up on to a perch to dry its plumage. Next day when it saw the pan of water it hopped in straight away. It now knew what water was, even when quite still and unrippled.

I have repeated this experiment with a young jackdaw, two eyass sparrow-hawks, and a young merlin. Their behaviour was identical. When the water was undisturbed they took no notice of it, but as soon as the surface was broken they were interested, and in a few moments had stepped in, appearing to take keen pleasure in washing themselves, and doing so as thoroughly as if they had washed hundreds of times before. There was no difference, so far as I could see, between the behaviour of the novice and the experienced old bird—they fluffed their feathers out, ducked their heads under the water, and came upright again, so as to fling the water over their backs, at the same time beating and splashing the water with their wings, while depressing their outspread tails. In this way they got well soaked, especially when the performance had been repeated again and again. A hand-reared cuckoo behaved precisely the same. When shown water, which lay still and unagitated in a pan, it was quite indifferent, but was equally

quickly roused to action when the water was disturbed and made to swill about.

It is obvious that the impulse to bathe, and the actions of the bird in the water, are truly instinctive, as far as the first performance is concerned, the perception of the rippling water acting as the stimulus which sets the nervous machinery in action. But the bird, whether merlin, jackdaw, or cuckoo, is an intelligent creature, and if the " man at the wheel " is only a looker-on at the first bathe, we may well doubt if he is passive next time. With consciousness of what it is doing, with the enjoyment of splashing the water about and washing itself, the bird is gaining experience, and is storing up that experience as knowledge by which its behaviour will be governed in the future. All my young birds knew, after their first bathe, what water was, whether it was still or agitated.

How consciousness may accompany actions that were initially instinctive, and subsequently control and modify behaviour, was testified to by the merlin already mentioned. This little hawk, a " Jack," as the males are called, became so exceedingly tame that he was allowed to fly about quite free and go where he chose. He was very fond of bathing, and, being free, could have washed in many places, for there was plenty of shallow suitable water at hand; but no, he looked upon a big blue pan placed upon the lawn as his wash-tub and took a daily bath in it. Having seen me repeatedly fill it from a garden watering-can, he evidently, and quite rightly, associated his bath with the can.

Whenever he saw me coming with the can, he would swoop down from his perch or some tree-top and fly round me excitedly, even trying to alight on the spout of the can. Then, dashing ahead to the pan, he took perch beside it and waited until I filled it for him, when in less time than it takes to tell the water was splashing far and wide. Here clearly intelligence was superimposed on instinct. Instinct had originally made him bathe and wash himself according to the hereditary rite; the first time he stepped into the water "without thinking," as we say when we do some habitual action automatically, but next time he remembered the pleasure it had been and wanted to repeat it, and later he discovered that this great treat came out of the watering-can, and whenever he saw the can, expected and looked forward to a repetition of the delight.

Here we see instinct leavened by intelligence, as it usually is among the vertebrates, by a very alert "man at the wheel," so that the hawk, unlike the spider, could interrupt its series of actions, and begin again to bathe, without upsetting its performance. In the case of an orb-weaving spider, one of those spiders whose exquisite webs may be seen any morning on our garden fence, snare-making is not only an instinct, but is such a mechanical process that if interrupted when making a web the spider cannot take up its job where it left off, but has to begin again at the beginning. The manufacture of the snare is dependent on a series, a long and complicated series, of actions. Just as a stone dropped in a pool causes ever-widening wavelets to ripple

away in far-extending circles until they finally die out, so the original stimulus that started the spider into snare-spinning activity ripples through its complicated nervous system and produces a series of responses each the result of that which went before, and only reproducible by beginning again at the beginning.

Though awareness of what is happening may accompany instinctive action—by which I mean that the creature will perceive the result of its performance as it goes along—I think we may safely conclude that, as stated in the beginning of this chapter, instinct is unconscious and without pre-knowledge, and that in its performance it is like a habit, an action that has been repeated so many times that it has become automatic; just as we walk without thinking into a room where we have been used to go (not long since I moved from one bedroom into another, and for days after I found myself turning in at the wrong door), but in the case of instinct we are considering a habit peculiar to the species, not a mode of action acquired by the individual.

Nevertheless we should guard carefully against the assumption that instinct is inherited habit.

To assume this gives us an easy and simple explanation of the origin of instinct. If we can believe that all instincts were originally acquired as habits, which in their turn had been the outcome of intelligent purposeful action, we have a delightfully simple explanation which will save us the trouble of further thought. We have only to say,

the ancestral bird washed so often that washing became a habit, and this habit has been inherited, to explain everything—that is, IF the *acquirements of the individual are in fact passed on to its progeny*. By that IF this theory so popular among former writers on animal intelligence, whole-heartedly endorsed by Romanes and tentatively accepted by Darwin, stands or falls, and the IF is a big one.

Despite the vast amount of research accomplished since the Darwinian epoch on the problems of variation, heredity, and the evolution of species, only the very slenderest and most doubtful evidence has been obtained in support of the Lamarckian theory of evolution by the inheritance of the effects of use and disuse, while a huge pile of facts have accumulated pointing to the opposite conclusion, to the conclusion, namely, that changes induced in the soma, i.e. in the body, nervous system, or brain, of the individual, have no influence on, and are not passed on to, the next generation. Millions of children, for instance, have learnt to read, but no child has yet come into the world knowing, untaught, how to read, though nearly all children are endowed with the ability to learn, with that conformation of the brain that makes them readily educatable. There is no room here to give any details of the numbers of facts that have been accumulated. It can only be said that the evidence is overwhelming that the effects of the environment are not passed on.

The whole trend of modern evolutionary research has been to support the theory formulated by

Weismann, which he termed the continuity of the germ plasm, and in which he asserted that the germinal material was carried, unaltered except by actual material damage, by anything that happened to the individual, as a jewel is in a casket. According to him the germinal material is passed on from generation to generation, the individual being no more than its envelope, or guardian, the bearer, in fact, of that of which it was the outgrowth. Cytological research, the study of the structure of the cells, supports this conclusion to a remarkable degree, and seems to indicate that variation and the inheritance of variation depends on the manner certain minute bodies, known as chromosomes, are dealt with in the maturing and later in the conjugating sexual cells.

The American school of heredity assert that in these chromosomes are genes, or factors, that control the development of the resulting individual, and that it is from the alterations and combinations of the genes that differences and variations arise, variations of every kind from size, colour, and hairyness, etc., to psychological ones. My own researches confirm the fact that temperament in one species, namely, the polecat (*Mustela putorius*), is inherited as a simple Mendelian character.

In an experiment in crossing the domestic ferret (*Mustela furo*) with the wild Welsh polecat I found the polecat disposition, quickness and wildness, was dominant in the first generation, which in behaviour were perfect polecats, nervous, high-strung, and easily alarmed. The same thing has

been observed by others in the hybrid offspring of the domestic and Scotch wild cats. Kittens sired by a wild male (*Felis silvestris*) were so fierce as to early resent being touched or handled.

When we find psychological differences such as these are inherited in the same manner and according to the same laws as more obvious and tangible characters, can we doubt that they, and other peculiarities of the nervous system, reflexes, and instincts have originated also as variations, and have been built up, perfected, and evolved through selection continued through unknown periods of time ?

We may be almost certain that instincts, even the most elaborate, such as the marvellous conduct of the hive bee, have been evolved from simple beginnings, just as breeders, from some slight accidental predisposition, have evolved instincts, though not to be compared with those of the bee, in our dogs ; artificial instincts, it is true, but none the less as real as those of Nature. I mean the natural aptitude of the retriever for picking up game, of the pointer and setter for indicating where it is lying, of the sheep-dog for rounding up sheep, etc. Though education helps to perfect our dogs in the performance of their duties, the sheep-dog in rounding up sheep, the retriever in finding and bringing back to its master the game that has fallen to his gun, and the pointer in finding birds and indicating where they are, yet every dog-trainer knows that without the innate predisposition to do these things he cannot teach his charges. A

retriever retrieves "naturally," for the small puppy which has not yet learnt anything about game takes pleasure in picking up and carrying the things it comes across when at play. On this natural "gift," or instinct, is built up the superstructure of education, which results in a first-class retriever, that gently picks up the wounded partridge or pheasant and bears it to its master with never a feather ruffled. Imagine what a dog of another breed—say a fox-terrier, with no instinct to fetch and carry live game, but a strong instinct to kill—would have done with that bird: it would have torn it to tatters! To instil retrieving into a dog "that has no notion" is practically impossible, and so it is with other performances based on inherited aptitude or instinct. The dog-trainer, whether he be shepherd or gamekeeper, knows he must have, as he expresses it, a dog "bred to the work" which he will require of it. The shepherd, whatever his skill, cannot teach a retriever to round up his sheep; nor can the gamekeeper make use of a non-sporting dog.

Once in a way you may meet with "exceptions that prove the rule." Very rarely you may find a disposition to fetch and carry, or to round up animals, as the case may be, in an individual of a breed not used for such work; but such we may look upon as freaks, mental freaks, yet nevertheless as much freaks as a white blackbird or a brown rook. These freaks give us the clue to the origin of breeds showing specialized instincts. No doubt each breed originated with some dog that showed a

THE SPIDER'S WEB, SHOWING THE WONDERFUL SNARE OF THE ORB-WEAVER

special aptitude for finding lost game and bringing it tenderly back, or for helping get together sheep and cattle, or for pointing hidden birds, etc., which aptitude has been confirmed and strengthened by selection, through many generations of the best performers, which have been retained and bred from, aided possibly by further mutations in the same direction.

We can conceive a similar process at work in Nature, chance modifications of the nervous system (the word " chance " being used to signify modifications arising not really by chance, but through the action of causes, and laws, unknown to us), producing alterations in the animal's behaviour, with regard to its innate disposition to respond in a particular way to a particular stimulus. This alteration might be either favourable or unfavourable to the animal's prospects in life. If favourable, then the creature would prosper and leave descendants. If not of survival value, yet nevertheless not harmful, the variation would still be propagated, though making no difference to its possessor. But if a handicap, if the mutation was harmful—if, for instance, the departure from type took the form of an absence of fear and nervousness, of that quick alertness to take alarm which makes wild creatures shun all that is strange, and man in particular—then the variation would be disastrous and the individuals displaying it would be wiped out ; just as a variation in the direction of extra caution, i.e. of nervousness and wildness, would be preserved.

Though the action of natural selection is obvious in such instances as this, and we can see the parallel between generalized wild instincts and generalized instincts of man's selection, we begin to wonder when we study the marvellous and complicated instances of instinct in Nature, not generalized predispositions, but clearly defined sequences of action, leading along a definite course to a definite result, as hard and concrete as a crystal, and seemingly as invariable and unalterable in their happening as was the making of that crystal; whether, after all, natural selection is really competent to evolve such a perfect series of complicated and co-ordinated actions. Can this all have been brought about by the survival of the fittest?

Can the spider's snare, the exquisite web of the orb-weaver, have been evolved by natural selection? Can the wasp that makes a cell in which to house its egg, and stores in it comatose spiders as food for the unhatched grub, spiders paralysed by being stung in just the right spot to paralyse without killing them, have learnt her trade by the piling up of variations of the nervous system and its responses to different stimuli under natural selection?

It seems impossible, incredible; but I do not hesitate to record my conviction that the Darwinian theory is the only one that explains the phenomenon of instinct and the marvels of the instinctive behaviour of living organisms, and that it is by the selection of variations, small and big, in the way these organisms respond to the influences of

their environment, to their physiological state, that the most marvellous and complicated examples of instinctive behaviour have been built up.

Far from thinking that instinct is intelligent behaviour become habitual, or, to sum it up more concisely, that instinct is crystallized intelligence, I believe the two not only to be far apart, but that instinct is far older than intelligence, for consciousness and intelligence must be comparative new-comers into the arena of life, while instinct, or that from which instinct has originated, mechanical response, must be as old as life itself. When we consider this, and consider the vast periods of time during which it is now believed that life has existed on this earth, is the evolution of exceedingly complicated series of instinctive actions so impossible or improbable ? Moreover, we must not forget that in no aspect of life is selection so rigorous—the creature whose instinctive machinery does not function properly is eliminated without fail ! The caterpillar that does not construct its cocoon properly perforce perishes ; the migrant bird that takes the wrong course is lost at once ; and so we might go on indefinitely—instinct when it fails, fails hopelessly, and that individual is wiped off the slate. There is no second chance for it !

Reverting to the history of instinctive behaviour, we have noted that the evidence before us is suggestive of instinct having been evolved earlier than intelligence, and that the conscious adapting of actions to needs is a later product of evolution. The most highly intelligent species of the many

kinds of animals that have peopled this globe, i.e. man, comes on the scene very late in its history, for his earliest remains of which we have knowledge only belong to the Pleistocene time, which is recent compared with æons preceding it.

Some of the prehistoric creatures were animals of great bodily bulk, enormous unwieldy brutes, but their great carcasses were crowned with comparatively small heads of yet smaller brain capacity. Compared with the huge bulk of their bodies, their brains were infinitesimal. As intelligence is certainly correlated with cerebral capacity, and creatures with big brain-cases are invariably more intelligent than those with small heads, we may safely conclude that these monsters had a low mentality. No doubt they were endowed with consciousness, but their perceptions must have been most rudimentary: they would probably be aware of the warmth of the sun, of their fellows around them, food when it was before them, and so on; but that small brain could have had little to do with the management of the great body over which it presided. Here the "man at the wheel" must have been a very feeble, useless little fellow, the running of the great machine depending almost entirely on the way it responded to the stimuli received by the senses, and on what those stimuli were.

No fact is made more plain by the study of palæontology than that the size of the brain-case, and consequently of the cerebrum, decreases as we work back down the palæontological series, until the vertebrates vanish altogether—now it would

seem that consciousness and awareness may arise independently of the vertebrate cerebrum, for some invertebrates, notably insects, give evidence of having a memory (witness the hive-bee, which learns the surroundings of its hive), but we can find little evidence of intelligent behaviour apart from it. The backboneless animal is almost entirely the slave of instinct. This is not, as said before, to deny it a lowly form of consciousness, but it is a consciousness with practically no influence on the course of events or on how the body will respond to its own internal happenings or to what goes on about it. Such responses are part of the machinery, and take place automatically. In the very earliest protozoan forms of life not even this can have been there, but merely the most rudimentary responses of the protoplasm to that which affected it.

Tracing the nervous development upwards, we find throughout those immense deposits of rock representing the pre-Cambrian, Cambrian and Ordovician, and part of the Silurian periods, only backboneless water-dwelling animals, in whose fossils there is no indication of any development of the nervous system beyond such as would enable them to respond to direct stimuli, such as contact with food.

The ages during which these lowly beings preserved the unthinking tenor of their ways must have been immeasurably great ; but in the Devonian rocks we find higher forms—fish with backbones and a brain. The long Carboniferous period gave rise to amphibians, which was another step forward

in the direction of brains; and throughout the Permian, Triassic, and Jurassic periods, the last named the age of reptiles, the development of the cerebrum went on; yet in all the varied reptiles that dominated the world at that time the brain-case was still small compared with the way it has been enlarged since. Intelligence as yet must have played but a small part in the conduct of life —modern lizards and amphibians are of but lowly intelligence—and instincts have still been the dominant factor in animal behaviour, unreasoning mechanical response guiding most of their actions. Still, it is almost certain that some of these ancestral species had advanced, they were not entirely unconscious automatons; awareness had entered into the situation, with it memory, and experience, and in consequence the modification of actions in the light of experience—the machine was no longer running almost or entirely "on its own," for the "man at the wheel" was beginning to help it steer a course through life's happenings.

When the warm-blooded mammals and birds came on the scene the "man at the wheel" increased in importance, for larger and yet larger cerebrums were evolved as species succeeded species, each with a greater meed of intelligence, surpassing its predecessors, only to be in turn surpassed—until we come to man, as yet unsurpassed!

That the larger instinct-ridden creatures, especially the very bulky ones, were bound to be superseded is obvious. The earliest Metazoan beings (many-celled creatures) could have had no more

intelligence than, say, a sea-anemone exhibits to-day, and were, of course, correspondingly handicapped, for when anything unusual took place they were helpless; they could not adapt themselves, or rise to the occasion, or in any way help themselves. They were just automatons fitting into a certain environment, and any being that could adjust itself easily and readily was bound to win in the struggle for existence.

One of the great differences between instinct and intelligence is that instinct, save through hereditary variation, is immutable. It is a cast-iron convention, like the ancient customs of China; while intelligence is adaptable. Instinct cannot profit by experience, intelligence is always learning, gaining experience and knowledge how to adapt conduct to achieve its ends. Intelligence is synonymous with educatability; instinct cannot learn, it can only act precisely as its ancestors have acted for untold generations, and perish when circumstances are against it.

The consequence is that the intelligent beings have flourished and prospered, and now possess the earth, but instinct is yet here, fragmentary in the highest animals, more perfect in the lower ones, and yet the supreme power that directs the behaviour of the lowest, which still exhibit the wonders of automatic behaviour. Its immutability often costs them dear, but they make up for their losses by great fertility. The unintelligent organisms nearly all increase very fast, i.e. the moth lays anything from fifty to three hundred eggs or more, the oyster's ova number a couple of million;

but the intelligent ones can maintain the numbers of their species with a very low rate of increase, i.e. man and the elephant.

We have seen that instinct is as old as life itself, that it consists of mechanical responses to stimuli, often received from without, which we term reflex actions, and that a series of such actions are used to build up the complicated and involved instincts such as we see in the nest-making bird or our wasps and bees.

But the intriguing question already alluded to is, Do creatures performing for the first time an instinctive action, or sequence of actions, know what they are doing? Have they any preconception of the goal of their actions? Now, habitual actions have this in common with instinctive ones, that they are performed mechanically and, as we are only too well aware, "without thinking." That, I think, gives us the clue we seek—the young bird stepping into water for the first time does so, not because it has a sudden vision of itself splashing water about and enjoying a good bath, but because something (the sight of the rippling water) makes it want to step in, when, "without thinking," it finds itself splashing about in the water, and incidentally thoroughly enjoying itself. But henceforth the instinct to step into water and splash about will be modified by the experience of having bathed—next time it sees water it will *know* what it is.

It would further seem that the performance of an instinctive action is pleasurable—the retriever puppy

likes to pick up and carry things—the non-performance of action for which the appropriate stimulus has been received being likewise unpleasurable. For instance, what could be more acutely unhappy than a mother animal that has been deprived of her young, and of all outlet for her maternal instincts?

It may be said in concluding this chapter that the creature acting instinctively does so with, at the first performance, no knowledge of the whys or wherefores of its behaviour—it finds itself doing something which it is pleasant to do, and which it wants to do, without knowing why it wants to; and that a great many creatures move through their lives with little more awareness than that for any of their actions. They just find themselves doing things, as we find ourselves performing actions that have been repeated so often that they have become habitual. But unlike habits, which are only acquirements of the individual, the sequences of actions we call instincts are not only hereditary, but as much part of the specific character of the creature as its form, colour, and markings, and equally subject, with these outward and tangible characters, to the action of natural selection and evolution.

CHAPTER X

MIGRATION

WHAT does a bird think, what is in its mind, has it any thought, when it leaves the circumscribed territory that has been its world for several months, and journeys forth by valley and river, along coast-lines, and across seas, to a destination many hundreds of miles away ?

Pied wagtails, marked as nestlings in the English Midlands, have been recovered, still wearing their rings, in Spain and Portugal—*e.g.*, a bird ringed by Mr. J. R. B. Masefield in Staffordshire (*British Birds*, vol. x., p. 152), and another, ringed by Mr. A. Mayall in Buckinghamshire (*British Birds*, vol. xvii., p. 237). And swallows, also ringed in the British Isles, have been retaken as far away as South Africa, namely, " in Cape Province, Orange Free State, and East Griqualand," and another, ringed as a breeding adult, was reported from Natal (Witherby's *Handbook of British Birds*, vol. i., p. 507).

Every spring and autumn a vast movement occurs among the bird population of the temperate and cold zones of both the northern and southern

hemispheres, but the birds of the tropics remain stationary. They have no cause to move—the others have. These latter ebb and flow with the seasons like tides in the sea. The bird hosts of northern regions ebb south in the autumn, to winter in more genial quarters, and flow back to their breeding-places in the spring. In the southern hemisphere a similar though reversed movement is performed according to the seasons.

During the spring flow of the tide many of our northern species travel from Africa and the Mediterranean region to the Polar circle, to breed on the temporarily snow-freed tundras and mosses of that inhospitable part, and then retreat south once more. Twice, in less than six months, do they make the long journey, to a certain spot to breed, and back again to their winter quarters—how do they manage it ?

The love of home, of a certain small territory which the bird regards as its very own, is, we know, a powerful factor in bird life (see the chapter on "Territory"), yet with the coming of autumn the majority of birds, outside the tropics, quit this much-loved spot and wander off. Even species we regard as residents, such as rooks, blackbirds, and thrushes, are not exempt from the fever. The latter may be classed as migratory birds, for most of those bred in these islands cross the English Channel for the winter, but their places are taken by individuals from farther north, and so we do not miss the ones that nested with us. There is hardly a bird in the cooler parts of the world that does

not travel more or less, some less than the others, some more, some very much more.

That it is the question of the food supply which is the cause of the autumn emigration is obvious, especially as regards insectivorous birds and those species which breed in the inhospitable northern regions where the winter is severe; but though it is unquestionably the reason, it does not in the majority of cases seem to be the direct incentive.

Take the swift as an example, for a bird like it, which lives entirely on aerial insects, could not possibly winter in Northern Europe or the British Isles, yet it leaves here long before it need. As soon as its young are strong on the wing it hurries off, disappearing early in August; indeed, in the Midlands, where I live, we seldom see many swifts after August 5th. The majority of swifts are leaving England by the end of that week, though the summer insect swarm has not yet diminished and myriads of gnats and flies are still dancing in the air. What is it that, with food in plenty around and the English summer at its height, urges the swifts to go? What impulses, what premonitions pass, I wonder, through those strange bird minds of which we have so little conception?

Before attempting any guess—and at the best it can but be a guess—at the impulse which sets the emigrant off a-journeying, it will be desirable to give some account of the phenomenon of migration, especially of how the birds travel, and to do so I shall quote from Dr. W. Eagle Clark's authoritative and admirable *Studies in Bird Migration.*

Dr. Eagle Clark spent many years on and off our coasts studying the problems of migration, and his book is a classic on the subject.

To begin with, he found that migratory movements were largely dependent on the weather, and the birds only embark on them when conditions are good. He says: "It has long been realized that birds are extremely sensitive to atmospheric conditions, and that they discern approaching meteorological changes . . . migratory birds are specially influenced, since their movements are undoubtedly correlated at all seasons with the weather, which has a controlling effect over their performances, either as an incentive to embark upon their aerial voyages or as the greatest of barriers to their performance" (vol. i., p. 171).

The weather required for successful migration is anticyclonic, settled fine weather, in fact, with light winds. The direction of the breeze is of little consequence, but an eastern or south-eastern current is the most favourable, both for the autumn and spring flights. Though the direction of the air currents has little effect on the migrants, Dr. Clark shows that a change of temperature does markedly affect them, a fall in the autumn or a rise in the spring initiating big movements.

As the journeys undertaken are long ones, and as the birds, for all their sensitiveness to meteorological conditions, cannot judge the weather maybe a couple of hundred miles ahead of them, they sometimes get caught in adverse weather, in storms and heavy winds, and meet with disaster. Take,

for instance, a great flight witnessed by Dr. Eagle Clark on October 11, 1903, from the Kentish Knock lightship, which, he says, was one of the "greatest diurnal movement of birds" that he had ever seen. "It set in at 8 a.m., with a marked passage of starlings, skylarks, and tree-sparrows. By mid-day it had assumed the nature of a 'rush' which was maintained without a break until 4 p.m. It was a remarkable movement in many ways. Skylarks, starlings, chaffinches, and tree-sparrows not only passed westwards in continuous flocks, but many of these companies consisted of hundreds of individuals. So numerous were the starlings composing some of these bands that when first observed in the distance they resembled dark clouds, and formed a conspicuous contrast to the leaden, white-crested billows. The elements contributed to the singularity of the scene. The weather, which had been fine up to 9 a.m., rapidly changed, and by noon it had become, in nautical parlance, a 'dirty day,' a character which it maintained to the end. The rain, which fell steadily at first, became a downpour, and finally torrential. Indeed, so rain-laden did the atmosphere become that it was necessary to sound the fog-horn, whose hideous yells added a weird accompaniment quite in harmony with a scene which, apart from its intense interest to a naturalist, was dismal and depressing in the extreme. The wind, too, had been gradually rising, and by 3 p.m. had increased to a 'strong breeze' with a velocity of 34 miles per hour. There were squalls at intervals, which lashed the rain against

my face with such violence as to cause the skin to tingle for a considerable time. How the migrants braved such a passage was truly surprising. How they escaped becoming waterlogged in such a deluge of wind-driven rain was a mystery. Yet on they sped, hour after hour, never deviating for a moment from their course, and hugging the very surface of the waves as if to avoid as much as possible the effects of the high beam wind. It was surely migration under the maximum of discomfort and hardship; indeed, under conditions that approached the very verge of disaster for the voyagers." (*Studies in Bird Migration*, vol. ii., p. 11.)

It should be noted that despite the terrible weather that had overtaken the unhappy migrants they "sped on, hour after hour, *never deviating for a moment from their course*"; though they had to hug the waves, and their field of view must have been limited to the crest of the next wave, or, at the most, that of the following one. Though unable to see ahead, and hampered by the worst of weather, they were steering a true course.

This dismal account of the crossing under bad conditions must be contrasted with the following, when fine weather prevailed, which was witnessed from the Eddystone Lighthouse on October 12, 1901. The flight began at 7.15 in the evening "and continued without a break until 5.45 on the morning of the 13th. The weather was favourable both for emigration and observation. The wind was a gentle breeze from the south-east, and the

very slight haze that prevailed made it necessary to burn full power in the lamps, whose rays were thus doubly brilliant, and hence extraordinarily attractive, as they streamed out upon an atmosphere eminently suited for rendering them exceptionally conspicuous.

"The first migrants to appear were a few starlings, and from 7.30 these birds were present in numbers down almost to the very last movement. They were followed, in the order named, up to midnight by blackbirds, skylarks, stonechats, redwings, fieldfares, wheatears, and song-thrushes. To this hour the birds had continued to arrive and pass on in a steady stream, while many struck the lantern. Soon after midnight a great increase in the emigrants was observed, and the movement assumed the character of a great rush southwards. Song-thrushes, redwings, mistle-thrushes, blackbirds, starlings and skylarks, then appeared in vast numbers, and were followed by chaffinches, grey wagtails, goldcrests, fieldfares, white wagtails, meadow pipits and curlews. At 5 a.m. the movement was again intensified by a fresh arrival of most of the species named and of others, including a grasshopper warbler, which struck the lantern, while a small party of herons passed close over the dome, calling loudly as they flew by.

"There were also many small passerines and a number of larger birds—probably waders, from their notes—present during the movement, but their identity was not established. The skylarks, starlings, song-thrushes, redwings, and blackbirds

appeared to be the species most numerously represented, and vast numbers of them were observed, but certain of the smaller birds were almost equally plentiful."

Dr. Clark goes on to give a distressing account of the fascination of the great lamps of the lighthouse exercised over the birds. Though huge numbers went on steadily southwards, many were unable to resist the light.

"Throughout the movement, and especially when it was at its height in the earliest hours of the morning, the scene presented was singular in the extreme and beyond my powers of word-painting. Hosts of glittering objects, birds resplendent, as it were, in burning gold, were fluttering in, or crossing at all angles, the brilliant revolving beams of light. Those which winged their way up the beams towards the lantern were innumerable, and resembled streaks of approaching light. These either struck the light or, recovering themselves, passed out of the ray ere the fatal focal point was reached. Those which simply crossed the rays were illumined for a moment only, and became mere specks on passing into the gloom beyond. . . . Finally, above and below the madding crowd in the illumined zone, great numbers of the migrants flitted round in all directions in the semi-darkness, and in almost weird contrast with the brilliant multitudes gyrating in the adjacent vistas of light. The babel of tongues, too, was a very striking feature. . . . Some skylarks, every now and then, under the impulse of excitement, no doubt, broke

out into a few notes of song." (*Ibid.*, vol. i., pp. 289–291.)

The number of birds attracted to the light, though great, was only a small percentage of the hosts passing by and over the lighthouse, all winging their way steadily southwards through the darkness, and as such a movement would extend for miles, the multitude travelling must have been enormous.

Similar flights, and many of them, occur every spring and autumn round our coasts; thousands of birds crash to death against the lights of our lightships and lighthouses, but millions make the journey in safety, both the outward one in the autumn and the return one in the spring. Again we must ask ourselves, How do they do it? How do they know their way? How do they steer their course? And do they know whither they are going?

Dr. Eagle Clark stresses the fact that the greatest amount of bird-travelling is done at night, that most movements begin at nightfall, the voyagers flying on throughout the dark hours, as, for instance, on the night described above, when the bird stream was unceasing until well after daybreak. Now, homing pigeons, we know, are helpless at night. The minute the dusk creeps over the landscape they descend, and seek shelter until the following morning, when, with the returning light, they can see their way. They seem to be quite dependent on their wonderful eyesight, and failing it, are helpless, being unable to negotiate the shortest

distance in the dark. Racing pigeons that have covered hundreds of miles since their liberation in the morning have been known to spend the night out though they had almost reached home, being unable to find their way for a mile or two in the dark (see article on the Bordeaux race in the *Homing Pigeon*, July 4, 1924).

Yet migrant birds, of many and most diverse species make long and complicated journeys chiefly in the dark; they may *know* their way, but they certainly do not *see* it! Moreover, we have seen that most of the travellers fly low, that some may fly high, but the latter are not so numerous as those that flit along just above the waves, when, even by day, they cannot see ahead, let alone take bearings from landmarks. It is obvious, indeed, that sight has little or nothing to do with their steering, and we must look to other senses for the means by which they keep their course.

Not only do the voyagers maintain direct courses over wide expanses of sea, but the migrants follow what are now well known highroads, which can be charted like shipping routes on a map of the world.

The great routes of North-Western Europe follow chiefly the coast-lines. For instance, there is one great migration track from the Far North, down the Scandinavian coast, across the North Sea, to our shores, round these, across the English Channel, and down the coasts of France, Spain and Portugal, to Northern Africa. This is but one instance out of many. There are innumerable routes, from main

thoroughfares across the seas, to minor roads up valleys into the interiors of the countries. It is asserted by some scientists that the ocean crossings correspond to old land bridges; but whether this is really so or no, it is certain that the birds, and tiny frail species at that, go gallantly forward across wide seas, steering a usually unerring course from shore to shore.

I say "usually" because we know birds do sometimes go astray. How many wing their way into pathless seas, and go on and on, until they sink exhausted into the waves, we cannot say, but the weary travellers that alight on ships tell that such tragedies occur. Moreover, the rare visitors which wander to our shores in the spring and autumn are vagrants that have lost their way. When a desert wheatear is taken on the Pentland Skerries, and a Savi's warbler on Fair Isle, we may be sure they were migrants that were hopelessly lost.

On reaching their destination, or rather, on reaching their homeland when on return migration in the spring, the birds appear to travel up the big rivers, and then spread out up their tributaries, using these little valleys and waterways as the side lanes, by which to reach that particular spot which to them is home.

The Severn Valley is one of these inland routes, and I have seen the bushes on the river bank alive with warblers, sandpipers scuttling to and fro at the water's edge, and swallows and martins hawking over its broad current, days before any one of

these birds appeared on the higher lands a mile or two away from the river. Yet, though the travellers may tarry for a day or two in the valley, they gradually work their way up the tributaries, and thence, as mentioned before, to the particular spot which to them is home. I say "particular spot" because there is evidence that birds do indeed return home, to the hedge, boggy pool, clump of bushes, field, hillside or building, where they were reared, or where they bred the previous season. Martins on arrival may be seen inspecting the remains of last year's nests, ditto swallows, and I have watched a pair of great tits (a species in which the migratory impulse is confined to more or less local movements) examining, long before they wanted it, their nest-hole in the back-yard pump. No great tits had been seen about the house for some time, but one February day I heard their unmistakable notes in a tree near at hand, saw two birds fly out, come down to the pump, when one went into the hole, stayed a moment, came out, and the other went in. After this they were continually about the shrubbery, and in April they nested in the pump. With regard to the swallow, there is an account in Mr. W. C. Tait's *Birds of Portugal* which well illustrates what home means to the spring migrants. "They arrive in pairs, usually very tired, and on one occasion he"—a friend of Mr. Tait's—"actually saw one pair arrive. They were flying very high, and when they came over his house they dived steeply down to their own quarters. One bird settled on an iron rod projecting

from the wall, but its mate was so tired that it remained for a few minutes on the ground until recovered sufficiently to fly up and rejoin its mate on the iron roof. This would indicate they had made a very long flight direct to their old quarters without resting" (p. 115). Further on Mr. Tait remarks that the old nest appears to be the lodestar which induces them to return to their home. With regard to the house-martins, he says : " It is very impressive to hear their loud and joyous twitterings when they arrive at their old nests" (p. 117).

In some species, indeed in a great many species, the males arrive on the breeding-grounds ahead of the females, and straightway " peg out a claim," establishing themselves in a piece of hedge, among some bushes, or on another desirable spot. It is the warblers I have in mind at the time of writing, for in their case the cocks get home days ahead of the hens, and it is possible a good choice of territory makes all the difference whether a young cock is regarded as desirable or no by the ladies.

But this chapter is not an essay on the courtship of any one of the warblers ; we are discussing migration and the migratory impulse, and wish to gain a little understanding of the mind of the bird traveller. However, the question of the males in certain species arriving ahead of the females has its bearing on the problem, for it shows that males and females travel separately. This is notoriously so in the case of the chaffinch. The winter flocks, more often than not, are divided into cocks and

hens, and it is as parties of one sex that they go a-journeying. The brambling of Scandinavia, which is closely related to the chaffinch, also has a liking for forming separate parties. Once, in Norway, in the valley of the Surna, I had the pleasure of seeing a party of gay little cocks returning, as I assumed, from their winter wanderings. It had been an exceedingly cold, late, wet spring in this Norwegian valley, and the snow had only just retreated from the higher ground, while on many parts of the fjelds it still lay deeply, and all the heights were white. Despite the fact that it was the middle of June and a certain number of birds, such as fieldfares, were breeding, the season was very backward, and there were very few bramblings that had begun nesting. On June 15th I was walking up the lane that ran parallel to the impetuous current of the Surna, when I paused to look for a brambling which was uttering that long-drawn anxious note which the bird gives when worried, when I was surprised to see a number of cock bramblings flitting across the narrow strip of cultivated land that lay between the road and the riverside bushes. One behind another they came, gorgeous little fellows in their tortoiseshell plumage and black heads, to alight in the wayside birch-trees, where I had an even better view of them, ere they flitted on, over a cotton-grass-dotted bog, to the steep birch-covered fjeld-side, where they disappeared from view. Quite fifty passed, all cocks in full breeding plumage, whose tortoise-shell colouring glinted exquisitely as they flitted

through the young greenery of the birch-trees. It was my belief that, held back by adverse weather (for weeks it had been of the cyclonic type, rain, wind, and sleet driving across the country), they had only just got home, after travelling up the river, whence they passed to the fjeld-sides, which were their nesting-grounds.

We now come to the most difficult, if most interesting, part of the subject of migration : What arises, what passes in the mind of the bird traveller ? Those bramblings had probably wintered in England, where likewise would be many hens of the species ; where, too, food would be plentiful and easy to obtain. What was the impulse that made them wing their way back across the North Sea to the birch-clay valleys of Norway ? It is easy to reply, " The longing for home, the same longing that sends human travellers back across the width of the globe," but did they indeed have a vision of home ? Possibly this was so. When the chill March sunshine warmed their blood it may have brought memories of silver-stemmed birches, dashing waterfalls, gnarled pines and snowclad fjelds, making our more cosy countryside seem of small account. Once or twice bramblings have stayed to nest in Scotland, but on each occasion the spot has had some likeness to a Norwegian valley.

It is almost certain that the homeward migration in the spring is intimately connected with the state of the reproductive organs, and that as these begin to develop and get ready to function, the bird becomes restless, and the desire to make

THE RETURNED TRAVELLER—A SWALLOW RESTING IN THE SUNSHINE AFTER REACHING HOME

northward to the breeding-grounds arises. Whether the active sexual organs release hormones into the blood system, which stimulate the nervous system, is an interesting hypothesis, which admirably fits the facts. On this assumption the desire to get home would arise as a reaction from the stimulus of the nervous system. We can imagine (but please note it is only *imagine*!) the bird which has been happy and contented all winter in comfortable quarters where food is plentiful, feeling restless and uneasy, troubled with broken memories of birch thickets and tall hills, and a longing to be moving. For days and weeks this longing will trouble it, ever getting more insistent, until one evening, one still, quiet evening, the impulse to go is overpowering. Its crop is full, the pangs of hunger do not thwart the wish to fly, there is no wind to make it hesitate, and other bramblings are moving on each side. Into the twilight they rise, and fly off, and fly, and fly. Whence comes the feeling that they must fly in that one direction, how, on the pathless seas do they keep their course? To say, "By instinct," is simply saying, "We do not know!" But I put this query: As birds have obviously a keen sense of direction, can it be that their delicate systems are sensitive to magnetic influences—can they "feel" north and south? In fact, is the bird a living compass? So far as I am aware no observations have been recorded of the effect of magnetic storms on migration. Such disturbances, it must be remembered, are not necessarily connected with atmospheric disturbances.

If it were found that migration ceased during magnetic storms, or that birds went astray at such times, we should have a valuable clue to one of the greatest problems that faces the naturalist, namely, the bird's sense of direction.

If a bird has such a "feeling" for north and south, it does not follow the answer that it finds its way "by instinct" is not correct. What length of time has been occupied by the evolution of birds it is impossible to say, but migration is certainly no new phenomenon, and by its very nature means the most rigid selection of the species practising it. The slightest mistake or failure entails the extreme penalty of death. Now, granted that the bird has a feeling for direction, it may be that selection has evolved a desire to fly in a particular direction. When the bird gets on the wing it will feel it must go one way, though young birds on their first outward travels can have no awareness of why or whither. They must be impelled by a "want," though a want of what they know not. We know that far more complicated reflexes have been evolved in those marvellous organisms—the insects, for in them action follows action, in unreasoning sequence, to a beautiful and perfect climax. But in them, if the ordered sequence is interrupted, the whole is stopped, each action arises as a reflex from that going before it, and intelligence plays no part; but the travelling bird is not the victim of a set of mechanicalized reflexes like this, only of a more or less generalized impulse, and should anything interrupt its voyage, such as

being deflected from its course by a lightship, it will journey on again afterwards.

So far we have been referring chiefly to the spring or homeward migration, but the outward movement to winter quarters in the autumn must not be neglected, for then the movement is at its greatest, huge numbers of young birds swelling the ranks of the travellers. Where old and young travel together there is nothing that calls for special comment, but where the young ones travel independently of the old, as in the case of the cuckoo, we have evidence that the migratory impulse is indeed instinctive. As already pointed out, the old cuckoos (which, in any event, had no knowledge of their parasitic young) go off quite early, and the rising generation do not migrate until a month or more later. Here there cannot be any leadership of the young ones by the old ones.

As to what supplies the initial impulse for the autumn exodus we are much in the dark. Few birds stay until their food gets scarce, but go while it is still plentiful. In some instances it is probable a slight fall in temperature may be the stimulus which acts as the spring that releases the trigger of the impulse to be off, and that these earliest emigrants may fire other birds with the desire to go. I have known a captive brown owl be restless on nights when wood-pigeons and wild geese were passing over, yet this owl is a more or less sedentary species. That the impulse to go spreads like wildfire through their ranks we know from the accounts

of the great rushes of birds that go south past our lighthouses.

Though the bulk of autumn emigration takes place before there is any food problem, severe weather later in the year will drive south still more birds, especially wild fowl and waders. These, doubtless, are directly influenced by bad weather and want of food.

No doubt such movements were the original form of migration, a retreat before bad conditions to seek better quarters, with a return when the severe weather improved. On this foundation selection worked until the extraordinary journeys of modern birds were possible.

Mammals, which, of course, cannot travel like birds, nevertheless show us something of the origin of the migratory impulse, but here we have the whys and wherefores more clearly defined, and less encumbered with an elaborate superstructure of instinct. Take the Norwegian lemming as an example—this pretty little rodent is in favourable seasons exceedingly prolific, when it multiplies and increases until it overruns the country. Usually confined to the higher ground and the neighbourhood of the saethers, it comes down into the valleys, eating everything before it, and under pressure of necessity seeks fresh grounds, even swimming rivers, and fjords, and arms of the sea. The year after the lemming season, not a live rodent will be visible, but everywhere one comes across the remnants of the host. Their bodies, mummified while they lay under the snow, are to

be seen on all sides, as are their runs, tunnels, and nests. To speak of lemming *migrations* is perhaps a misnomer, for it is obvious the lemming does not want to travel, it only wants to get a little space to itself and plenty to eat ; still, travel it does until disease and the coming of winter wipes out the host.

The movements of caribou and other animals in Northern America are more akin to bird migration, being *bona-fide* retreats before the severity of the winter, with a corresponding return home in the spring. Yet nowhere do we find any mammalian movement to compare with the voyages of birds, not even that of the migratory bats of North America, though, as already remarked, considering the superior means of locomotion possessed by birds, we could hardly expect to.

To sum up the suggestions comprised in this chapter, it is believed that migration is largely instinctive, that the birds find their way and keep their course by means of a sense of the magnetic north, but that awareness accompanies their most unreasoning actions, and intelligence steps in and accompanies impulse, so that experience counts, especially to help the old bird find its way home.

CHAPTER XI

THE HOMING "INSTINCT"

THERE is a widespread, popular belief that many animals and birds if taken to a distance can find their way home again "by instinct." Many are the stories told of cats returning after being taken away, of dogs that have journeyed many miles to get home, and so on. Those not acquainted with pigeon-flying also take it for granted that the homing pigeon will return to its loft wherever it may be turned out. As pigeons are sent long distances from home for the purpose of racing them, hundreds of thousands being flown annually, this idea would seem to have ample justification. Here, indeed, it would appear is a well-testified and obvious case of the homing instinct, and those who have not studied the homing impulse in the pigeon will further liken it to the migration movement so common among other birds, especially to the return migration in the spring. The spring migrants when they pour across the Channel to our shores are coming home, the racing-pigeons sent for liberation at Nantes or Bordeaux make just the same journey to reach their English homes. At first glance the

phenomenon would appear identical, but analysis shows so many differences that such a conclusion is rendered doubtful, to say the least.

To begin with, racing-pigeons are subjected to a long and careful training, without which they are utterly useless. Migration is successfully undertaken by young birds and appears to be independent of experience and guidance. Moreover, it is largely performed at night, when the migrants cannot see much of the country over which they journey. In contrast to this, pigeons are unable to fly at night; they travel by day, and if overtaken by darkness descend to rest. They require long and careful training, and all fanciers agree that they profit by experience, and without it are useless. They learn their way home, so that a "North Road" bird would not be expected to make good its return if sent south over a course it did not know. The whole system of pigeon-racing is based on the assumption that pigeons are intelligent and gifted with good memories, that they remember the country, or at any rate landmarks, over which they have been flown, and that sight is the great factor that guides them on their way home.

This is borne out by the fact that homing pigeons will not fly on after dark. "I have known a bird come to earth four miles away; and I know one other that failed to do the last half-mile both from 'over there,'" says a writer ("Blue Cheq") on the subject of the Bordeaux race in the *Homing Pigeon* of July 4, 1924, apropos of the question that pigeons should be released as early in the morning

as possible when they have a long journey ahead of them, because otherwise they may lose the race through getting benighted.

That it is not a case of "will not," but that pigeons are unable to go on after dark is borne out by the Army experiments conducted in France during the war. "The young birds in one loft were exercised, when hungry, at a later and later hour each evening until they were eventually flying in the dark, and were fed into the loft by aid of a red lamp. They were then liberated singly after dark at gradually increasing distances from the loft, being again fed in by the red lamp. It was found, however, that immediately the distance was increased to a stage when the red lamp could no longer be seen, the birds became hopelessly lost, and the experiment was given up." (*Homing Pigeons and Pigeon-Racing*, by B. B. Riviere, in *British Birds*, vol. xvii., p. 119, from information supplied by Captain W. D. Lea-Rayner.)

It is equally common knowledge among those keeping racing-pigeons, that the birds when flying home are greatly hampered by drizzling rain, and poor visibility, and get lost altogether in a fog; in fact, it would seem that they depend entirely on their eyes.

It will be necessary to revert for a moment to the method of training, which is a gradual one. At first the pigeons are taken but a short distance from home. A writer in the *Racing Pigeon* says: "My policy of training is to keep them coming home from one line, and that as direct as possible. First

toss, two miles; second toss, five; third, ten. At the ten-mile stage give them at least one toss if you can liberate two at a time." (*The Racing Pigeon*, July 5, 1924.) But now we come to a peculiarity of the training, and of the pigeon's behaviour, which would seem to contradict all that has been written about the bird being entirely dependent on eyesight to find its way, for when the pigeon has accomplished the fifty-mile stage, which has been attained by small degrees, we are told the distance may be safely doubled, and the racer liberated at one hundred miles from home! When once the hundred has been attained, the distance can be again doubled or even trebled, i.e. to enable it to compete in cross-Channel races when a wide arm of the sea has to be crossed.

Now no pigeon, to whatever height it may rise, will be able to see the distance between the last two stages, so has this domestic variety of the wild rock-dove (*Columba livia*), an almost non-migratory species, got some special sense of direction, of orientation? Does it know instinctively which way to go? Does it infallibly know its way home?

We have already seen that if it has any such special sense it fails to steer the pigeon after dark, in fog, or under conditions of bad visibility; and we shall also find that the losses of racers are large, more particularly over the longer distances. Some idea of the odds against long-distance racers can be gleaned from the following figures of losses supplied by Captain Lea-Rayner to Mr. Riviere for his article on the Homing Pigeon in *British Birds*: "Young

birds raced up to 150 miles, 50 per cent. Remainder as yearlings, raced up to 250 miles, 50 per cent. Remainder as two-year-olds, raced up to 400–500 miles, 75 per cent. Thus, if I started the year with 100 youngsters, I should not be disappointed if I had 50 to do 150 miles well this year, 25 do 250 miles well next year, and 5 do the 500 miles' journey afterwards. The yearling and two-year-old figures include the Channel toss, barring out and out 'disasters' which are invariably due to weather conditions."

Such heavy losses as these, and the very fact that they are considered as being merely in the day's work, show that though pigeons do manage to negotiate considerable spaces of strange country they only do so with risk, and have no infallible homing instinct that automatically guides them home? How then do they manage it? I think Mr. Riviere has solved the problem when he ascribes the solution to a faculty for keeping their bearings, combined with training to fly in a particular direction, and a wonderful memory for country that has once been traversed. He says when "trained pigeons are liberated in strange country, the first thing they do is to fly round, 'trying' all the points of the compass and searching for any recognizable landmark. If they fail to recognize any of the country within their field of vision, they then take the direction which they have always been accustomed to fly, and maintain it until they reach some remembered landmark. This instinctive consciousness of the points of the compass, which enables pigeons to take the geographical direction which they have been used

to flying, is, it will be observed, a very different thing to 'homing by instinct,' and it only enables them to reach home if the interval of strange country which has to be negotiated is a continuation, in a fairly straight line, of the route they have become accustomed to fly."

Now in the chapter on "Migration" I have suggested that most birds must be sensitive to magnetic influence, to that magnetic or electric stress which makes a magnet point, and therefore, be aware which is north and which south. Thus the highly developed sense of direction possessed by the migrant bird, would be neither more nor less than a sense of, a feeling for, or a knowledge of (whichever words you prefer) the points of the compass. If this is so, then it is a far greater sensitiveness than that of the homing pigeon, since it enables the migrating myriads to fly on during the night with as great a certainty as if they could see their way, and maintain, moreover, their direction under hazy conditions of bad visibility that would hopelessly confuse racing-pigeons.

The pigeon, it seems, has just enough of this sense to enable it to know the direction it should fly, the direction which it has been trained to fly in, and so, on liberation, it flies round until it has taken its bearings and then makes off on the accustomed line.

With regard to the question what effect, if any, magnetic storms have on migrants and on homing pigeons, Mr. Riviere has the following interesting note: A "bad type of weather is that preceding and

during a thunderstorm, under which conditions pigeons appear to 'panic' and lose their heads, and are very frequently lost."

Perhaps it is not their heads, but their sense of direction, which they lose!

Further light on this is shed by some remarks of a writer in the *Homing Pigeon* of July 4, 1924, running as follows: "Many of the losses were sustained this season in comparatively short races, which, under normal conditions, the poorest bird would have successfully flown. Unfortunately some of the veterans went down in these races—birds accustomed to the game, birds bred to racing, birds prepared and conditioned for racing.

"It seems, therefore, that the cause did not lie wholly in the birds. We can only account for such losses in the shorter races by attributing them to that bewilderment which lies outside the bird, although the nervous system of the bird responds to it, like a highly tuned electrical instrument. It assuredly lies in the air, i.e. in prevailing meterological conditions, and probably has its source in electricity, that elusive force which accounts for many of the strange physical phenomena we experience at times. If this be true, we can understand the bewilderment which sometimes besets pigeons, and appreciate its varying effects on various subjects."

This closely approaches my theory, but the writer does not appreciate what it is that is upset, namely, the bird's sense of direction, based on its sensitiveness to the magnetic north.

From what has gone before, we see that though the pigeon is intensely devoted to its home, more so, possibly, than any other bird, we have no evidence to show that it possesses any special "homing instinct" under the unreasoning, unconscious guidance of which it can return safely from any distance by night or day.

What we *do* discover is that it is largely dependent on its intelligence to get home, on memory and experience, and on its eyesight, but that it almost certainly has a sense of orientation which enables it to take from a strange place the direction in which it has been trained to fly, and which it has been taught will take it homewards.

We can imagine the waiting pigeons in their baskets, their liberation after the long journey, their rush upwards into the cool, clean air, each bird with a picture before its mind of its home loft, of its mate, and probably of its nest and eggs; and then the whole flock swinging round, circling in the air, while many pairs of keen eyes search the farthest horizon; and lastly a general recognition of the way in which they must go, when one and all turn and make off, winging their way homewards at a velocity of some fifty miles per hour.

Turning from the pigeon to other species, can we find elsewhere evidence of a specialized homing instinct? The rook is a bird in which we might expect to find it, for it manifests such a great attachment to its home, returning each night to the rookery to rest in company with its fellows.

In the chapter on "Flock Movements" I shall deal

at length with the behaviour of the rook flock, of its journeys to and fro from the great roosting-place to the feeding-grounds, and shall refer to the demoralization that overtakes the flock when the weather is foggy. Like the homing pigeon, the rook is bewildered by mist, and in thick fog is helpless. Anything more hopelessly lost than rooks on a foggy day it would be impossible to conceive. They fly round and round, calling and cawing, settling in the trees, only to again take wing and try to get in touch with their fellows. Some give it up, and sit there cawing, others fly off and wander round again. Under ordinary circumstances it is a most extraordinary and exceptional thing for any rooks to sleep out—they all go home with the regularity of clockwork, but on a foggy night they are perforce obliged to stay. I have several times, when thick fog prevailed, known rooks roost in the trees around my home though, as they would fly, but a bare half-mile from the rookery. One would have thought that if they possessed the slightest sense of direction, or anything approaching a homing instinct, they could have got home. But they had to stay where they found themselves!

Yet in contradiction to this clear evidence that rooks cannot accomplish the shortest of journeys home when unable to see their way is the fact that rooks sometimes join in the autumn emigration and have been observed at the lighthouses *at night*, along with other migrants.

What can be the explanation of this? I hazard the following guess: We know that the rook as a

species is a most sedentary bird with the strongest attachment to home and the home district. Are not these migrants young birds of an exceptionally roving disposition, that have got caught up in the autumn rush south? It is probable they have some sense, like the homing pigeon, of the points of the compass, enough on the arousing of the migratory impulse to keep them journeying south, but not enough on a dark and foggy evening to enable them to find their rookery.

There is a widely accepted belief that the domestic cat can find its way home if removed to a distance; in fact, that it has a marked homing instinct. Popular belief further ascribes this power in a special degree to the "toms."

That cats have marked affection for localities, and if taken away from home will get back if they can, is not questioned; but the author greatly doubts if the occasional return of a cat to the house whence it has been removed is to be ascribed to any special instinct, special sense of direction, or superordinary power.

When one analyses the evidence, one finds that the numbers of cats removed from their homes which do *not return* is very large compared with those that come back, and that in the rare instances when a cat reappears it is usually a "tom."

Now the wandering proclivities of the male cat are notorious. In the dark hours of the night Thomas travels far in pursuit of his amours and on poaching bent, so that the extent of country known to him is difficult to estimate—it is more likely to be under-

estimated than overestimated, for even the quietest and apparently most stay-at-home specimens will get over a surprising amount of ground. I well remember remarking to a friend on his fine tom cat, to which he made reply that the cat was not only a good-looking one, but was very well behaved, since he never, *never* went off wandering or left the premises. A few hours later that very cat was at my home, at the back door, courting our household puss. He had only come, " as the crow flies," something over half a mile ; but the episode showed how the most stay-at-home of toms get about ! It shows, too, that any ordinary average male cat may be relied on to know his way over a wide area, and if taken to any point within that district may be expected to make his way home. Moreover, even if he is taken so far as to be out of the country he knows, he may, during his nightly prowls, reach that district by merely wandering about, but having once got into a familiar area, all he has to do is to hasten home ; such a return being due to chance combined with knowledge ; though it is often assumed to be an example of the cat's extraordinary homing instinct. But for one cat that does return under such circumstances numbers do not, and as for females, the greatest distance I have personal knowledge of one returning over was a mere quarter of a mile !

The following instances of cat removals have come within my personal notice : Three old females, two being four years old, were taken in company with the family, dogs, etc., a distance of five miles by

THE POACHING CAT, WHICH WANDERS FAR ABOUT THE COUNTRYSIDE

road and four "as the crow flies." All settled down at once, and showed no restlessness. Two adult females, moved with the family, a distance of one mile, stayed without demur. One female, and two large neuters, brought in company with their mistress a distance of twelve miles, settled at once in the new home. All the above were common smooth-haired "barn-yard" cats of sporting proclivities. A fine adult "tom," a long-haired cat, much given to wandering, and a confirmed poacher, was given away on account of his continued absences. He was sent three miles away, and *did not return*. This last mentioned is a cat that might have been expected to come home, had he been endowed with anything approaching a homing instinct, for the distance was not so great, and his knowledge of the country was considerable.

The only return I have to record was that of a two-year-old blue Persian tom, which was sent about three-quarters of a mile from home, across a Lakeland valley, and got back again a week later. By no means an extraordinary feat for an adult male, and certainly not one requiring any special hypothesis to explain.

It certainly seems that the alleged homing faculty of cats does not exist, supposed cases of it being really instances showing the knowledge of country possessed by some cats, combined, it may be, with a certain amount of luck.

The same conclusion applies to the return home of dogs. Huge numbers of dogs change hands, many escape and get lost, either temporarily or entirely,

but very few find their way home, and the extraordinary cases that are reported in print now and again are almost certainly not examples of the supposed homing instinct, but of luck, of sheer flukes, that have enabled the wanderer to get back.

These remarks are not intended to throw any doubt on the cat's love for its home, and on that of the dog for his human friends, nor to imply any question as to the desire of both these animals to return ; but they are intended to throw grave doubts on cats and dogs finding their way back to their old homes by any other means than chance, combined with memory for country that has been previously traversed.

In fact, I have been unable to find any evidence that the homing pigeon, the rook, the domestic cat, and the dog have a special homing instinct. In the pigeon we find that homing ability depends on memory and education, plus what appears to be a special sensitiveness to the points of the compass ; in the rook simply on knowledge of the land ; in the cat and dog ditto, the extraordinary returns popularly attributed to the latter being evidently due to chance.

There is nothing to show that any of these creatures could find their way back from a strange place by innate impulse or knowledge.

The return of the migratory bird is another matter, *that* we have seen is a matter of instinct.

CHAPTER XII

THE BROKEN-WING TRICK

THERE is no behaviour common to so many species of birds as the feigning of injury for the purpose of drawing a foe away from the nest or young. Such different birds as the mallard, skua, golden plover, partridge and skylark, to mention a few at random, all perform the trick, with equal skill. The " broken-wing trick " is the common property of a diversity of feathered creatures, and it seems as much part of their hereditary equipment as the nest-building impulse.

Before dealing with its origin and purpose it may be well to give one or two descriptions of the way it is performed, taking the case of a partridge first. I was walking across a rough ferny piece of land, when a partridge jumped up almost under my feet, only to drop within a yard and scramble fluttering along the ground, uttering queer cries the while. From the spot whence she had risen quite a dozen tiny chicks ran hastily, like a swarm of bees dispersing, into the grass, and vanished. No doubt they crouched there, when their dainty red and brown down would make them invisible. At any rate,

they disappeared in the twinkling of an eye. They were gone, but their mother still floundered desperately on the ground, where she had been joined by her mate. Off they went, trying to lure me away, and I followed, as I assume a fox or a cat would have done. Neither bird seemed to feign any particular injury, such as a broken wing or a broken leg; it merely flopped about, as if trying to fly and unable to rise, at the same time scrambling along at a pace which increased the farther we got from the chicks, and ended in a sudden "whirr" of wings, as it rose and skimmed away.

A lapwing gives a very similar performance when startled off newly hatched chicks, trailing a wing perhaps even more realistically than a partridge; but does not do the trick for the sake of the eggs, which it generally leaves some time before the intruder gets near, contenting itself with flying round and crying "Pe-wit!" For a matter of that neither does the partridge indulge in any theatrical display when only eggs are at stake; yet the Arctic or Richardson's skua will put up the most elaborate and intricate version of the broken-wing trick for the sake of its two or three green and olive-brown eggs. When you walk over the nesting-ground of this species the owners of eggs roll about before you more as if drunk than injured, tumbling over the tussocks of heather and grass in the most helpless way, yet on the islands of the Shetland and Orkney groups where I have studied this bird there are no native predaceous animals, no indigenous foxes, cats or weasels. True, there are robber gulls, great skuas,

great black-backed gulls, etc., and there were formerly white-tailed sea-eagles, but so far as we can see the broken-wing trick is practised essentially for the benefit of the predaceous mammals. We can only suppose that this behaviour has been evolved in mainland nesting situations, where foxes, etc., are a serious menace.

That the trick is effective when practised upon such creatures as foxes and otters I can testify, for I have seen Moses thoroughly fooled by a wild duck (mallard). This duck was of the domesticated strain known as the decoy duck, which is like the true wild duck in all particulars, and can fly as well as the wildest. She had made her nest about five yards from the edge of a pool, under the shelter of a small bush, and was sitting close, when I took Moses for a walk in that neighbourhood. The otter was poking about in the grass, when she appeared to wind the sitting duck, and sprang forward, making a grab at her. Now the duck was tame, very tame, and had I disturbed her would either have hissed and pecked at me or merely toddled away. She had certainly had no previous experience of an otter's attack, or had any occasion to practise the broken-wing trick, yet she now floundered from her eggs and scrambled, flapping, towards the water. The otter dashed after her, into the water, along which the duck splashed, quacking loudly. On the duck went, the otter swimming her hardest after her, until at the far end of the pool the duck took wing and flew off. The otter's air of bewilderment was laughable. She swam around, then up and down the pond, and

back again to the spot where the duck had taken wing, as if unable to make out what had happened. The duck's ruse was completely effective as a means of drawing the foe away from the eggs, and the otter was thoroughly deceived. The duck's achievement was also noteworthy as an instance of behaviour that appeared truly impulsive and instinctive. She had almost certainly never seen an otter before, and could have had no knowledge of an otter as an otter; and almost equally certainly she had no experience of performing the broken-wing trick; moreover, it all took place so suddenly and so quickly that she had "no time to think."

The broken-wing trick is evidently an hereditary impulse or instinct, the trigger that releases it being the sudden fright occasioned by the appearance of a strange creature—the otter in the wild duck's case, a person in that of the skuas. But though at its first performance the broken-wing trick is probably an unreasoning mechanical action (judging by ourselves, fright will paralyse thought for the time being), it does not follow that it is so entirely mechanical at subsequent repetitions. In fact, here, as in most instances, we may expect to find experience modifying instinct, and instinct and intelligence co-operating together.

As we have no reason to believe that habit and instinct have anything in common, or that acquirements (habits) can ever be transferred to the hereditary make-up, the origin of this useful response is difficult to see, though we can comprehend that once in existence, natural selection would ensure it

was retained and improved. That it is very ancient in origin and of considerable survival value is proved by its widespread occurrence throughout the group of birds. The majority of ground-nesting birds perform it when the necessity arises ; but, it should be noted, not any of those that nest out of reach of predaceous beasts, and to whom it would be no use. It is not practised by the cliff-breeding gulls, such as the kittiwake, but their relations the skuas perform the trick most perfectly, and so we could go on quoting many similar instances.

CHAPTER XIII

TERRITORY

IT is seldom realized, except by field naturalists, what importance the question of territory assumes among animals and birds. By "territory" I mean the "beat" which they regard as their own, that may vary from a few yards of hedgerow, or the corner of a garden, in the case of a robin; to a quite large area in the case of a pair of foxes.

Half the actions of wild animals—nay, in the case of the robin, two-thirds of its behaviour—may be attributed to the problem of "the estate": the acquiring of a beat, the keeping of it, and driving off trespassers. This business occupies nearly all its time not employed in feeding and resting.

The great purpose of life, its propagation, cannot be fulfilled until a residential estate has been acquired, and even then the territory has to be held against all comers. There is little doubt that the exquisite songs of our singing birds are not so much to woo the females as to warn rival males off claims that have already been staked out, for in the case of the warblers, so exhaustively studied by Mr. Eliot Howard, the cocks arrive here on the spring

migration well ahead of the hens, choose a location, and there await the arrival of the females, singing defiance meanwhile at their fellow-bachelors.

In the case of birds that do not proclaim their rights so openly, and are not gifted with lovely voices, the fact that each pair has its estate is liable to be overlooked, yet many species do peg out claims, and are most tenacious of what they evidently regard as their rights. You do not, for instance, find more than one pair of sparrow-hawks in any given area of woodland; nor, likewise, more than one pair of tawny owls; nor, yet again, more than one pair of moorhens on a small pool.

The moorhen is a bird that strictly enforces its territorial rights in a manner most interesting and amusing to watch, and as I have studied this species long and carefully, I propose giving my notes on its behaviour at some length, as they will illustrate what a powerful factor "territory" is in the lives of many birds and beasts, and will also give us some clue to their mental outlook on the question.

In 1915 I noted (writing on March 15th): "The garden pond has had no moorhens on it during the winter, though there have been quite a number on the other pools, but about a week ago a pair put in an appearance, the hen comparatively small, dark, and insignificant, the cock big and handsome, the scarlet shield on his forehead being especially brilliant. The pair took up their residence on the pool, and seemed thereby to consider they had acquired the right to the sole use of it—sole use, that is, as far as their own species was concerned. Since

then they have bitterly resented other moorhens appearing even within sight of the pond, and seem to spend the greater part of their time chasing intruders away. Two days ago two brave strangers appeared and walked as far as the water. The resident pair saw them and immediately rushed to drive them off, the cock running about the bank with his head stretched out, while the hen, also with neck extended, swam across the pond as fast as she could. A bush hid the meeting, evidently a furious one, as the birds emerged from behind it locked in combat. Cock to cock, and hen to hen, they fought, pecking at one another, falling over on their backs, and combing each other's breasts with their feet; scuffling and clawing, both pairs of duellists tumbled into the pond, where, lying on their backs in the water, they struggled more furiously than ever, to the entertainment of some wild ducks that came and looked on."

Sometimes one bird got on top, sometimes the other, but both clawed and pecked as hard as they could, yet so far as I could see neither could claim any advantage, and this remark applied to both pairs of combatants. So they went on for about five minutes, when suddenly and simultaneously the invaders broke off the fight. The two strangers wriggled away, scrambled out of the pond, and ran off as if their lives depended on it. After them went the owners of the pool, tails spread, heads down, as hard as they could go, and only gave up when the invaders took wing and flew off to the big pond.

Then the cock ran up to his mate, spread out and dropped one wing, at the same time spreading his

tail fanwise, and almost bumped into her as he strutted round her. It looked exactly as if he was saying, "See what a fine chap I am; I've driven off those trespassers!" As a matter of fact, the hen had done as much driving off as he had.

On many subsequent occasions I saw this performance repeated after a combat, the cock in the pride of his victory drooping his right wing and spreading his tail in display before the hen, but she did not seem much impressed by his antics. He had little reason to boast of his prowess, for she was quite as pugnacious as he, and though when pair fought with pair she took the opponent of her own sex, she would, in her mate's absence, chase off strange cocks as well as hens. Both she and he attacked every new-comer, irrespective of sex.

That possession was ten, not nine, points of the law, was obvious from the demeanour of the invaders, who always seemed nervous and had a guilty appearance, and held themselves ready to retreat at a moment's notice. Yet when seen, chased, and driven away, they would often display much cunning in running in and out of the bushes, and round about, until they ran back to the pond on which they wished to trespass, showing a persistence quite at variance with their previous nervous and guilty air; but of course there was no respite for them until they retreated in earnest.

In 1916 I noticed that there were disturbances among the moorhen population of the pools as early as January 30th, and by February 3rd driving and chasing had begun, showing that territories had

already been claimed, and that the warning off of trespassers was now in full swing. Notes of various combats were recorded, also a cessation of activity brought about by bad weather, frost, snow, and gales, and its resumption on a change to milder conditions, moorhen business being very active as soon as March came in. For instance, the 30th was a day of great doings ; my notes being as follows :—

" While still dark I heard them calling, and when I looked at my watch at 5.25 (Greenwich time) there was a noise of ' Wit ! Wit ! Wit ! ' and cackling going on. Looking out of the window at 5.40, I saw several moorhens running about the lawn and swimming up and down the pond. After watching them it became apparent that ' my pair ' were repelling the invasion of *two pairs* of strangers. From six o'clock to half-past six it was most exciting. Both cock and hen went for the first pair of trespassers, the biggest one, the male, attacking the bigger of the two invaders, and the hen going for the rival female. The resident cock chased his foe the full length of the pond, the latter swimming as hard as it could, whereupon the pursuer increased his speed, until he was splashing along the water, half swimming, half flying. Away went the invader, out at the end of the pool, over the railings and into the meadow, where the stranger stopped and faced the rightful indignation of the owner of the pond. For a moment they faced each other with extended necks, exactly, except that their neck feathers were not standing out, like two angry gamecocks. Up into the air they sprang, again like gamecocks, only

to drop back into their respective positions, when they menaced each other once more, before yet again sparring, though without result, and once more they glared at each other.

"Suddenly Number 2 (the trespasser) took to his heels and ran, but the scoundrel was not fleeing, only leading Number 1 a dance. With his determined foe hot on his heels he described a circle, flew over the railings and back into the pond. Here, on the water, Number 2 swung round and faced the ire of Number 1. 'Hammer and tongs' they went it once more, the water flying and splashing until even the wild ducks swam up to watch the fray. The two moorhens appeared to sit on their tails in the water and then bounce into the air, only to fall back with a splash, and comb away with renewed energy with their feet. At last Number 2 broke off the combat and fled in earnest across the meadow, Number 1 following almost to the other pond, after which he ran home, calling 'Croo, cra, croo!' to his wife, who had been driving off the rival hen.

"They met with extended necks, and mutual displaying, strutting round each other with white tail-fans spread and right wings drooping, but before they had done showing off they spied the second invading pair at the upper end of the pool.

"Away they went after them, chased them to and fro, and even in circles about the meadow, with an untiring activity that was extraordinary. At last they succeeded in driving them off only to return and find that the first trespassers had come back.

"There was further furious fighting, but the proprietors of the pool were more than able to hold their own, and soon drove off the intruders; but, no sooner had they done so than the second of the trespassing pairs was back! This went on, first one pair of invaders and then the other returning again and again, until 8 a.m., when there were so many people about that the moorhens were disturbed and the strangers ran off. The owners, far from being exhausted, seemed still full of fight, and ready to defend their territory for an indefinite period. Indeed, the duels were resumed soon after, for immediately things were quiet again the trespassers came sneaking back, only to be chivied off as soon as their presence was detected.

"The resident pair, evidently animated by an intense indignation, successfully held the pool, and kept off all other moorhens, attacks from which slackened as the season advanced, so that they were left in comparative peace from the time the nest was completed and incubation begun."

As a further example of the importance of a residential estate in bird life, take our familiar robin. It is well known to those who feed birds, and take an interest in birds about the garden, that robins do not come like sparrows, by the half dozen together, to feast on the crumbs put down, but one bird will appear at the front door, and another, say, at the back door, while other robins seen about the garden, never come near. This is because each robin has its territory, a territory held throughout the year, with the possible exception of

the moulting time, to which it strictly adheres, and which it defends against all comers. The old story that the young robins kill their elders is founded on the many "scraps" and battles fought by young robins when trying to stake out their claims; while that cheerful song we know so well, and which is heard throughout the winter, is the robin's defiance of all and sundry and a warning to trespassers that they will "be prosecuted." The corner of a garden, the fifty or sixty yards of hedgerow, or the piece of plantation, which constitutes a robin's home and headquarters, is very precious to it; not lightly to be quitted, and most vigilantly patrolled. As soon as you enter its territory, the owner comes to see what you are about, watching you with that perky and inquisitive eye that we all know so well; while a stranger of its own species meets with an immediate and very "warm" reception. The robin, moreover, is distinguished by its habit of singing practically all the year round, save when in moult, not only the cock bird, but also the hen doing so, as was proved by Mr. J. P. Burkitt (*British Birds*, vol. xvii., pp. 294–303), who ringed a number of robins, including several pairs caught at the nest, and kept them under observation for a considerable period, and found that practically all his marked birds sang. As already remarked, the robin's song seems to be a means of advertising to its friends and foes that the bird has annexed a territory and means to hold it; and as both sexes have an estate, a separate one save when nesting, it is as important for the hen to sing as the cock.

Very few birds carry the territorial question so far as does the robin, namely, to hold an estate throughout the year, but are content with claiming an area for the breeding season, which, no doubt, is why the song is only heard for a limited period. The old idea that song was for the benefit of the hen, that the male wooed her with liquid sounds, the lady being so critical of ear that she picked the best performer, seems to have little foundation in fact. Not only, in the exceptional case of the robin, do the birds sing out of the breeding season, and even the hen raise her voice to heaven ; but we know that in many species, especially warblers, the cocks arrive here in the spring ahead of their mates, immediately secure a territory, and burst into song, though there are no females to hear them. The latter, as has been shown by Mr. Eliot Howard in his great work on *Territory in Bird Life*, do not turn up for a week or ten days after the males.

It seems that the song in most singing birds is a means of " letting off steam," a safety-valve for what we may aptly term " the joy of life," which wells up within them in the spring, which ecstasy is relieved by the outpouring of song. The superabundant vitality, the intense excitement that is the outcome of their physical state, is " eased off " by its means. That song and excitement are intimately related is shown by the fact that *frightened* birds will sometimes sing a few bars amid their alarm notes. But this does not alter the fact that the principal function of song is to advertise that a territory has been claimed, to let the females know there is a desirable

MOORHEN PATROLLING ITS TERRITORY

estate to be had, and to let other males know they must keep off. We can find little or no evidence, and much evidence to the contrary, that the Darwinian conception of the evolution of song by selection by attentive and admiring females has any foundation in fact. It will be remembered that Darwin's theory was that the female accepted as a mate, from among many wooers, the male whose song pleased her best. What we now know points to song being advertisement pure and simple, a very beautiful advertisement, an exquisite one, but nevertheless as much a means of saying, "I claim this place, which I am willing to share with a nice lady," as if it was printed and published in human language. It is significant that birds sing on after mating, but stop as soon as they have to busy themselves feeding young.

With regard to the state of mind of the bird that is singing, it is obviously a highly emotional one, a state of blissful entrancement that renders it oblivious to what goes on around it. I have watched a thrush in full song, noted its rapt expression and air of complete concentration on what it was uttering: it was obvious it was completely obsessed by the desire to sing, and sing, and sing.

This reference to the thrush's singing powers reminds me that here we have another familiar bird that affords an excellent illustration of the love of territory. Any spring morning you may hear countless cock thrushes proclaiming from their favourite vantage points that they are each the proud possessor of an estate. This spring (1926) my home garden

is occupied by four pairs—the shrubbery pair, the pair that have annexed the bushes by the pond ; a third pair, that have made some hollybushes their headquarters ; and a fourth in the kitchen-garden.

The pond cock and the shrubbery cock frequently meet on the lawn, when there is much bill-snapping and fighting—the song-thrush when angry snaps its beak with a cracking sound—and they had one " set to " which lasted over five minutes, when they flew most vigorously at each other, and beaks were snapping continuously.

On the lawn neither bird is willing to give ground, but when one gets too near the shrubbery, or the other too near the pond bushes, the invader retreats at once before the onslaught of the rightfully indignant owner. Not only, as before mentioned, is " possession nine points of the law," but " might " is *not* " right." It is " possession " which is the " right," and no one watching these thrushes, and other birds, could doubt that trespassers are not only aware they are trespassing, but are conscious of wrongdoing, and, though they may stay and fight for a while, are so well aware of it that they never fight with anything like the determination of the justly enraged occupiers—more often they flee immediately.

Returning from the territorial question among the passerines, who publish their rights by means of song, to some of the water birds, we find that the grebes also afford a good illustration of each pair acquiring and keeping an area. That fine bird, the great crested grebe, likes quite a large piece of

water to itself, and you never find more than one pair on a limited area; the little grebe, or dabchick, is content with a lesser estate, but each pair reserve a piece of reed-bed for themselves, their loud, bubbling call proclaiming the fact, and on this they allow no trespassing, resolutely driving off all intruders. The same fact has been noted with regard to the rare Slavonian grebe, the following account by Mr. W. Russell ("The Slavonian Grebe and its Nesting Haunt," *Country Life*, February 13, 1926) showing how bitterly this grebe resents any encroachment on its right. The writer says: "Each pair annexes as its own domain a small area of the reed-beds fringing the loch and resists any intrusion on the part of others. These territories . . . are all more or less naturally defined and the number available can be easily computed. Where a pair of grebes is seen frequenting one of these areas, it is fairly safe to assume that one pair only is nesting there.

"One great fight was witnessed by the writer. . . . The grebes under observation had their nest among the reeds in a tiny bay near the head of the loch. It should be stated that this nest was an exceptionally early one, and that the nesting with the majority of the Slavonian grebes had not yet properly commenced. One afternoon, the hen bird being at the nest and her mate idling about the margin of the reed-bed, another pair of grebes alighted on the water not far off and swam purposefully towards the bay. At once the pair in possession became excited; the hen left the nest, joined her mate, and

together they went to meet the invaders. A few short scuffles took place, but the strangers were persistent, and it was some little time before they eventually retired to open water. Once there, they must have uttered some very uncomplimentary remark or challenge, or it may be that the brooding hen exhorted her mate to further deeds of valiance, for suddenly the home cock took wing straight after his opponent, alighted, rushed at and closed with him. The screams of the birds, locked together in desperate struggle, and the thrashing of the water, could be heard all over the loch. The hen birds, meanwhile, floated close by, watching the affray, which lasted a full couple of minutes before the contestants separated. Little damage seemed to have been done, in spite of the commotion, but the strangers moved farther off to the middle of the loch, while the other pair returned to their home to remain unmolested, for a time at least."

Then take the birds of prey; eagles, falcons, hawks, etc., also annex areas of country which they hold against all comers of their own species. The golden eagle, for instance, takes a wide stretch of deer forest, mountain-top and valley as its beat. The area owned by each pair is a large one, but they patrol it daily, partly on hunting bent, and partly on the look-out for trespassers, who are immediately driven off. Once settled in a domain and an eagle is most faithful to it, seldom quitting its home territory until death, usually at the intolerant hands of keeper or shepherd, makes it quit for ever. Even when one of a pair is killed the survivor will stay on

in the old locality, winging its solitary way about the district.

There is an island off the Welsh coast, Skomer Island, where, some fourteen years ago, i.e. about 1912, a pair of golden eagles were released by the owner. The female, unfortunately, made an expedition to the mainland, where she was shot ; the male, with more discretion, confined himself to trips to neighbouring and uninhabited islands, and has therefore survived up to the present time (1926).[1] But here is the interest of the case from our standpoint: this eagle, though a lonely bachelor, without tie or attachment, and though he is as truly wild as the wildest eagle that ever flew over a Highland glen, is so devoted to the spot that he remains year after year. He has but to spread his great wings, and in half a day's flying he could reach districts where he might hope to find a mate ; but no, he stays on, it is home, *his* home, and he is not going to leave it. So he remains, a splendid vision of feathered power when, as I saw him, he sweeps over the island top or patrols along the rocky coast with the angry sea crashing beneath him.

Apropos of this eagle's disinclination to leave home or go in search of a mate, it must be remembered that the great birds of prey mate for life, and are faithful creatures, it being no uncommon thing for a bereaved bird to remain a solitary widow, or widower, as the case may be, for the rest of its life.

As an example of this take the classic case of the last of the British white-tailed eagles, namely, the old hen who lived on the West Cliffs, North Roe,

[1] See Note p. 184.

Shetland. This bird was unique, not only because she was the last of her race, but because she was white, being an albino, or semi-albino, probably the latter, for when Mr. G. E. Lodge saw her he noted she had light brown primaries, and a primary I saw in Shetland, picked up near her favourite resting-place, was also light brown. The history of this eagle, as I have had it from many different people, including natives of North Roe, Shetland, is as follows :—

Previous to 1887 there were a pair of normal white-tailed sea-eagles living on the West Coast, North Roe, which had their eyrie on the West Cliffs, but the hen died, whereupon the cock disappeared for some weeks, but eventually returned, bringing with him a new mate. This bird was, however, a freak, being nearly white, and so was recognizable at sight. She was soon known widely about the islands. The two eagles lived happily together for some years, nesting on the old site, by the waterfall upon the West Cliffs, and occasionally, according to one informant, going to an eyrie on the coast of Mid-Yell. That they reared one or two families is certain, but what became of the eyasses is not known. Then the male disappeared, undoubtedly shot, and the white female was left alone. She never found another mate, but remained on the islands, flying about them and resorting each spring to the old eyrie on the West Coast, repairing the nest, and sitting on it for a while. Thus she lived, in lonely widowhood, until 1917, when she vanished. It is believed she was shot by a crofter who feared she might take his lambs. At any rate, she dis-

appeared, having been in Shetland thirty years, and as she was of breeding age when she arrived, she must have been older than that.

It is noteworthy that had the old eagle not been so deeply attached to the islands she might have winged her way to Scandinavia—an easy journey for a bird of such magnificent powers as hers, and one commonly undertaken by small migratory birds —and found a mate ; but no, she preferred to live and die in the home locality, and that despite the fact that she was almost certainly born over the seas, being probably a young unattached bird, driven off by her parents, when found and wooed by the Shetland male.

The necessity that presses on the old birds of solitary species, especially the birds of prey, of driving off the adult young when another breeding season comes round, so that they may have their territory to themselves, is one of the annual troubles of the bird world, as not only have the parents the worry of making them go, but these unattached birds are constantly getting into trouble by trespassing on the territories of other pairs—that is, until they are able to settle down and make their own way in life.

Where death has removed old birds from a good estate all is simple—the first pair of young birds that come along take possession, only too often to be, in their turn, victims of a man with a gun. Certain localities are very attractive ; from the point of view of particular species they are all that is desirable (the attraction is often invisible to the human eye), and when situated in a strictly preserved area the bird suffers accordingly. There are coverts where the

sparrow-hawks are slain year after year, and never allowed to breed, yet each succeeding spring finds fresh victims awaiting the gun. The beautiful little merlin, in the same way, will resort, spring after spring, to the same spot on a moor, these particularly desirable spots being often veritable death-traps for it. As soon as one pair is shot another takes its place, only in its turn to be done to death.

A peculiar instance of the attraction of locality was that of the Shropshire ravens. For over half a century the raven as a breeding species was unknown in the country, but in 1918 a pair appeared near Church Stretton, in the very valley in the hills where ravens had last nested, and succeeded in breeding almost on the old site. Though with no bearing on the subject under discussion, it may be remarked in passing that the young ravens were killed in the nest when nearly ready to leave it, mischievous boys being the culprits.

But the attraction of locality is a side issue. The purpose of this chapter has been to show what "home" means to the wild animal, and what a force the love of home and the desire to possess territory is among creatures, large and small, furred and feathered; how they strive for estates, how they advertise they have got property, and how they fight to keep their territory.

NOTE.—April 1928. Alas! the Skomer eagle has lately met the usual fate of such birds. He left his island home for a visit to the mainland, and was, of course, shot. One lapse, after fifteen years of discretion, cost him his life.

CHAPTER XIV

THE STORING HABIT

IN us the hoarding impulse is generally and widely developed, being probably one of the factors, in conjunction with our over-developed brain, which has led to the immense success of the human species. It shows itself in the small boy who collects as many marbles as he can, in the small girl who acquires as many dolls as she can persuade her relatives to bestow on her; in the elder children who make collections of cigarette cards, stamps, butterflies, birds' eggs and such things; and in the grown-ups in a hundred and one ways, from the man who collects a fortune, and finds in money-making his greatest joy, to the man who, having the money, collects beautiful furniture, rare books, or old masters, and whose wife collects glittering gems.

It would seem a far cry from the crow that hides away a bit of shiny glass to the lady who owns thousands of pounds' worth of glorious jewels; it would seem an even further cry from the self-made millionaire to the bank vole hiding grain in its tunnel. They are indeed far apart, but yet

have a fundamental impulse in common; the latter to keep that which, though they do not want it now, they may want one day; the former to keep for their own joy the toys which please them.

The hiding instinct—and I am using the word "instinct," intentionally, and the word "hiding" to denote the putting away of anything, whether food or a toy, or an object that may become food one day—the hiding instinct, I repeat, might from this be supposed only to accompany a very considerable meed of intelligence and be found only in the more highly developed creatures, yet we find, next to the human species, it is most highly developed in the instinct-ridden insect, i.e. in the bee and in the ant. Apart from man no living things lay away such stores and collections as do the bees, some wasps, and many ants. In the bees we find vast reserves of food accumulated in special containers; in the wasps we find caterpillars, spiders, etc., collected and placed—after being skilfully stung and reduced to paralysed impotence—in cells ready to form food for the as yet unhatched larvæ; and in different species of ants we see even more extraordinary manifestations of the collecting, hoarding, and storing instinct; but it is not with insect behaviour we are dealing here, it is with animal behaviour, the actions of mammals and birds, and the deductions we may venture to draw therefrom regarding the mental forces that govern them.

The simplest example of the storing habit is the hiding of excess food that cannot be consumed

at the moment, i.e. the dog that buries a bone it does not want, the fox that likewise buries the remnant of the fowl it is unable to finish, and the rat that carries home to its burrow potatoes, grain, etc., it cannot immediately consume.

On the face of it such actions appear highly intelligent, to denote forethought, and to indicate the provision of reserves for a "rainy day." That caches are useful to their owner we can hardly question. The habit is too frequently met with for it not to be of some utility, and we cannot doubt it is of survival value. We might add, of "great survival value," but superficial appearances are not always trustworthy, and it may be doubted if they are in this case. When we see a dog hiding a bone, or find a rabbit the fox has buried, we may jump to the not unnatural conclusion that the intelligent animals have hidden their treasures with the intention of returning later for them. The question is, Had they any *intention* of putting it away for future use? How hard such a question is to answer. For though at first sight the answer would seem to be "Of course they had," we shall not be quite so sure about it after having given close attention and thought to the matter, as the following observations will show :—

In 1914 I had three voles—specimens of the common bank vole (*Evotomys glareolus britannicus*) —in confinement, their quarters being a roomy, glazed cage, which was furnished with several inches of soil, turf, and dry grass for bedding. They were well fed with green food, bread and grain. Like

so many of the rodents, this species hides superfluous food, but I was surprised to find how carefully these mice carried off all they could not eat at the moment. It did not matter how much food I put in the cage, it was all taken away and hidden. The three were very jealous of one another, and the first to find a new supply would work as hard as it could to hide it before the others came out of the nest. They had three methods of storing, the first being to scratch a hole and bury the treasure, the second was to cover it over with leaves and rubbish, and the third was to take it into one of the holes. The last way was that practised least, owing to the risk of the hoard being raided. These voles had no respect for each other's stores. One day I watched the biggest, known as " Billie," hide a piece of walnut. He took the greatest trouble over it. He carried it into a corner, scratched a shallow hole, placed it in it, then covered it up, partly by scratching the soil backwards over it and partly by pushing it into place with his nose, in just the same manner a dog buries a bone ; and then, with several pauses to listen if the others were about, he dragged forward lettuce-leaf after lettuce-leaf and piled them over the spot. At last he seemed satisfied that the precious bit of nut was safely hidden, and went away and washed his face. But hardly had he gone to the other end of the cage than a little red head appeared at the mouth of the hole that led to the nest, and one of the two females stepped cautiously out. She smelt and she sniffed, and then went straight to

the heap of lettuce-leaves, which she examined carefully, while Billie, apparently quite satisfied as regards his treasure, went quietly into the nest. But his lady friend was at work ; in less time than it takes to tell she had stripped the leaves from the spot, had dug down, unearthed the nut, and was nibbling away at it, nor was she interrupted in her illgotten feast. But I doubt if she would have been had Billie returned. When he wanted food from them he often assaulted the two females, yet as far as buried treasures were concerned it seemed to be a case of " out of sight, out of mind," both with him and with them. Once they had turned their backs on a hoard, they showed no signs of anger and annoyance regarding raids by the other mice, yet the amount of grain these bank-voles would hide was extraordinary. One mouse carried off seventy-eight grains of barley in fifteen minutes. Four grains were the most she could manage comfortably at a time, but she tried to get more into her mouth, when they slipped out at the corners, and she had to pick them up again. This happened several times. She never took less than three grains, and on a few journeys she carried six, but six was a great effort. The first two loads were buried separately, but the rest were taken down one of the holes (the nearest to the heap), and, judging by her quickness, she could only have dropped the corn and raced back for more without waiting to put it in place. When all had been carried away she carefully filled the mouth of the hole, blocking it up with earth.

On another occasion one of these voles took away 168 grains (oats) in twenty-two minutes, making forty-two journeys, with only four pauses. The first pause was to eat an oat, after which she listened for a moment; the next was to test and discard a bad oat; the third was when a noise startled her; and the fourth, quite a long pause, was for three minutes, in which she washed herself. With these exceptions she worked steadily for twenty-two minutes, when all the oats had been carried away.

What a long-sustained and continued effort this was for a small creature such as a bank vole. Yet I doubt, once the business was finished, if the mouse ever gave her store another thought. Careful watching convinced me that the position of the most elaborately hidden treasure was soon forgotten; as already stated, it appeared to be a case of "out of sight, out of mind." It seemed to be entirely a matter of coincidence if one of the voles brought to light some hidden grain, and I do not believe any one of them ever went of set purpose and opened a store; but more than once I saw a mouse, which was digging for other purposes, come upon grain it had hidden two or three days previously, and proceed, with all the signs of delight and excitement usually reserved for new supplies, to bury it afresh. I could not avoid the conclusion that it thought it had found either new grain or one of its fellow's stores.

Of course, the bank voles were well fed, having usually more food at hand than they could eat

(most of the buried grain sprouted and made little forests of greenery in the cage) and the promptings of hunger were absent, which in a wild state might act as an incentive to memory, yet I have doubts, and think it is more likely that hunger would merely spur them to hunt about, when they might come, accidentally, across grain and nuts hidden when times were good and food plentiful.

All my observations pointed to the very poorest of memories. The interpretation I put on their actions was that on finding food, and more food than could be eaten, they felt a keen desire to keep it, that their impulse was to carry it off, but that of thought for the future there was none. Supposing that a mouse had the mental power to look ahead, it must be remembered that these voles had no experience in their short lives—these observations were made in March, the voles having been in captivity all winter—of shortage of food, for they were young mice when caught. Apparently the sight of nuts or corn fired the voles with a desire to have and hide it. The impulse to carry it away seemed to be a true innate instinct, an inherited bias of the nervous system which impelled them to the task, but this does not imply that they did not understand what they were doing. All three voles obviously knew very well what they were about when hiding corn, pausing every now and again to listen anxiously and look around for fear a friend was at hand to rob them. They would fight and box for minutes at a time for possession of grain, yet I feel sure they were

not working with any purpose save that of keeping what they had found. They were exhibiting the collecting instinct, which in its rudiments is undoubtedly an involuntary reflex action, though even in mice never exhibited as purely such. We can safely conclude that even when a bank vole picks up a grain of corn for the first time in its life for other purpose than eating it, its action is so modified by awareness that it would be impossible to separate the innate impulse from the conscious modifications of intelligence.

That collections of grain and nuts made in this haphazard fashion may be of utility has already been indicated, for if stored in the recesses of burrows, that tunnel hedgerow and bank, they might be rediscovered in times of need; and so it is probable that the habit is of survival value and has been subject to natural selection.

The collecting impulse is common among rodents, and the squirrel (*Sciurus vulgaris*) may be cited as another example, though its actual performance falls very far short of that credited to it by popular imagination. The story runs that when the autumn woods begin to get chill and drear, and yellow leaves flutter down from the trees, the squirrel sets to work to gather nuts, which it stores in a hole in some tree, and upon the contents of this granary it lives comfortably, however long and severe the winter may be. It is hardly necessary to point out that if such were really the case it would mean that the squirrel was provident and far-sighted to a remarkable degree; as a matter of fact, it is

THE BANK VOLE, WHICH STORES FOOD SO DILIGENTLY

more scatter-brained and less careful than the bank vole.

What it does do, when in autumn nuts and acorns are abundant on all sides, is to bury a nut here, and another there, in the most casual and inconsequent manner. Many a stately oak owes its existence to having been planted by a forgetful squirrel, while many more nuts and acorns are scratched up by pheasants and other woodland dwellers. If the squirrel recovers any of the treasure-trove, it is luck and nothing more.

To watch a squirrel at work hiding nuts is most amusing. There will be a rustle in the nut-bushes, and a squirrel comes into sight, gleaming like red-gold among the branches, along which it runs with the skilful ease of its kind, springing from twig to twig, and running head first down a tree, equally at home in all positions. Once on the ground, it looks round, runs forward a few steps, makes a few quick movements with its forefeet, and drops into the shallow hole, thus scratched, the nut it was carrying in its mouth. A few more scratches with its paws, and the hole is covered over, when, with a "Vut! Vut!" it runs off, goes aloft again, gets another nut, comes down, and buries that somewhere else. So it will go on, hiding nuts, one at a time, here and there, over a wide extent of woodland. It seems, like the bank voles, to be animated by a desire to have and to keep, and when that is gratified the matter is ended, done with and forgotten.

This desire to have and keep, i.e. the collecting

impulse, is highly developed in that intelligent and successful species, the common brown rat (*Rattus norvegicus*). However great a pest this parasitic species may be, our dislike of it must not blind us to its abilities, and that so far as hoarding is concerned it is ahead of most creatures. Who has not heard of quantities of potatoes being found down rat holes, of numbers of eggs being carried off, and so on. Recently I found a rat's nest beneath a pile of timber, and around it, neatly piled up, were the bodies of dozens of toads. The rat had evidently caught them at a nearby pond, to which they resorted for breeding purposes, killed and brought each victim home. It had, in some cases, eaten their entrails, but in most instances the corpse was intact. It was a fine collection. It may be remarked in passing that the rat is one of the few animals that will kill toads. The acid secretion of their skin is enough to protect them from most predaceous birds and beasts, but the common rat does not mind it ; at least, the secretion does not prevent the rat killing large numbers of toads and carrying them off.

A very tame and quite domesticated rat, that I had for two and a half years, gave me considerable insight into the manner rats carry away and hide anything edible they fancy. This rat, whose full history will be found in my book, *Wild Creatures of Garden and Hedgerow*, was just an ordinary specimen of *Rattus norvegicus*. He was no fancy-bred rat, but only a very fine ordinary buck rat, that inspired those who were not acquainted with

him with all the repulsion usually felt for a rat, but was greatly beloved by all who knew him. Though this will be referred to in another place, I must say here that for affectionate intelligence and general "brainiess" I have met few creatures the equal of that rat.

"Whiskers," as he was called, was allowed to run about loose in the sitting-room in an evening, and had his headquarters under the bookcase, making there a nest of newspaper, to which he took his treasures, such as apples, odds and ends of food, bits of bread, etc. Each morning the housemaid swept out a curious assortment of oddments, and each evening the nest, and the collection, was re-begun. He had a similar but more extensive collection in his quarters in a small empty room upstairs, of which he had the run, save occasionally when it was necessary to shut him up in his cage. He slept in a box lined with hay, and packed with all sorts of things, including not only such nest-making material as rags and paper, but unconsumed food of many kinds. There were bits of dog-biscuit, walnuts, grains, chicken-bones, potatoes, filberts, and other things. When food was brought in he usually carried it, bit by bit, off to his nest, ate a little, and piled the unwanted portions up around him. As much of it was of a highly perishable nature, the sleeping-place would have got into a very unpleasant condition but for my cleanings, when Whiskers' accumulations were swept away.

Of course, this rat, like the bank voles, never

knew what want meant, and had no incentive to eat stale, nasty food, but he gave me the impression that the food was carried in for the pleasure of taking it off, to keep for his own what he had found, to gratify, in fact, the collecting impulse, rather than for any particular purpose. Intelligent as Whiskers was in other respects, I cannot credit him with taking food home as a provision for the future. He carried it to the nest because he wanted it, and that "want" arose from an inherited peculiarity of his nervous system, common to many rodents and other creatures, which enabled the sight of something desirable to start a train of reflex actions that culminated in the carrying away of the object in question. I certainly believe that the desire to take food to the nest was an instinct in the case of this rat—he always had good fresh food available, and had no reason to think of the future—but I am quite sure he was well aware of what he was doing, that the fundamental instinct was modified and controlled by a very keen intelligence.

It is noteworthy that though the squirrel hides single nuts here, there, and anywhere, though the bank vole hides its finds in caches near home or in a branch of the burrow, the rat makes its living-place its store, and you find its hoard in or near the nest. This is a decided improvement and step forward, and it is probable that the rat's collection is the most useful, and more often drawn upon than those of the others.

Though the collecting or storing habit might be thought to be only useful to vegetarians, or

creatures that are more or less vegetarians, like the rats, which feed largely on food that keeps good for some little time, yet we find it among the carnivorous birds and beasts, many of which hide superfluous food. Many hawks will, having eaten their fill, push the remains of their kill into some corner and *return to finish it the next day.* Ditto the owls. I have known a tame female sparrow-hawk go back in this way. She had been flown early in the day at a blackbird, but being in an independent mood had, after chasing the blackbird, which took refuge in a hedge, gone off on her own. Regardless of calls and whistles, regardless of meat offered on the hand, she remained in an oak-tree until afternoon, when she disappeared for a while, to reappear at dusk with a crop bulging like that of a pouter pigeon. She had evidently killed and dined well, far too well. Anxious to take her up, I was out at dawn the next morning, hoping to secure her before she was off to find herself another meal. No sign of her was to be seen, nor did she come to my call. After hunting for some time I heard the tinkle of a hawk's bell, which I located under a thick bush in the middle of a larch plantation. There was Bessie on a half-eaten moorhen. She had evidently fared sumptuously overnight, and returned to her kill to continue the feast in the morning. The plantation was two fields' length from the place where she roosted.

I have known a wild sparrow-hawk likewise return to her kill, coming back twelve hours later

to a wood-pigeon only partially eaten the previous day. The merlin and kestrel are also in the habit of putting on one side the remnants of any victim too large to be disposed of at a meal, and I have seen merlins, again trained hawks, carry a portion of a bird to the foot of a tree and push it into a hollow, also put a piece of meat under the edge of the block used as a perch. In fact, the latter was a regular custom with Shrimp, my very tame merlin. He used always to push extra food under the foot of his perch.

The brown owl has the same habit, only in a more marked degree. When it has more than it can eat, it is not content to shove the remains of its feast into the nearest apology for a hole, but carries the food off and hides it carefully, using as a larder some hollow in an old tree or other convenient place. A good place will be used regularly, and the food is seldom forgotten. My old pet owl, Hooter, always "lardered" anything he did not wish to dispose of at once. He had the run of the house, being allowed to fly all over it, and he had two or three hiding-places, his favourite being the top of the wardrobe in my father's dressing-room. Many a bird or mouse was laid to temporary rest upon it, only to be disposed of later, the next day or even two days after. There was no trouble until someone brought the owl a duckling that had died, unaware that the owl did not appreciate young ducks. Hooter took the fluffy offering, plucked a few beakfuls of down from it, and then carried it away. We saw him

fly upstairs with the duckling, but no one thought any more of the matter—not, that is, for a week or more, when there arose a strong and unpleasant smell in my father's dressing-room. The housemaid said it was "maggots," and she was right, for there, on the top of the wardrobe, was Hooter's duckling, in a state that the girl accurately described as "walking." "The authorities" were annoyed, considerably annoyed, and Hooter was sentenced to banishment to an outbuilding, a sentence only reprieved on condition that I kept careful note of his hiding-places and searched them regularly. I found that with rare exceptions, such as the duck, he always fetched his hidden food and ate it up. He seldom, if ever, forgot what he had put away, and his conduct was in marked contrast to that of the rodents, which has been described. It seemed a deliberate and thoughtful performance, and though it probably arose from the instinct we have found so widely present in mammals and birds of putting away what cannot be immediately eaten, there could be no doubt that it was intelligent in repetition and that the bird knew perfectly well what he was about, and, as I have already stressed, remembered what he had done with his goods. This latter fact appears to me to lift his performance greatly above that of the other creatures, and to show a much better memory and consequently a superior mentality. Though somewhat a digression from the subject in hand, it must be stated here that not only was this particular owl a highly intelligent bird, but that I have found the

brown owl a very intelligent species. Indeed, most owls are intelligent, and, taking the birds of prey as a class, they are far ahead of many mammals that are credited by the public with being "brainy."

In the *Corvidæ*, or crows, the collecting and hiding impulse is well developed, and includes not only storing away food, but any unusual object, such as a glittering stone, or with tame individuals, bits of glass, a silver spoon, or anything else that catches their sharp and inquisitive eyes—like the famous jackdaw of whom it was written, "When nobody's dreaming of any such thing, that little Jackdaw hops off with the ring!"

And so has many another jackdaw, both before and since his day.

In the largest, brainiest, and most cunning of the crows, namely, the raven, the collecting impulse is a dominant one. It is everlastingly hiding things, not only scraps of food, but all sorts of oddments, and seems to derive the greatest satisfaction from secreting strange and apparently quite useless objects. It is noteworthy that whereas the rodents and the birds of prey only put away food, the crows hide things that cannot possibly be mistaken by them for anything edible. It shows a marked advance in mental ability over the creatures referred to, that the crows take pleasure in, and desire to keep, objects that are of no use to them. It appears that there is not much fundamental difference between the collector of postage stamps or old china, or the lady with a mania for jewels, and the raven carrying off a

shining tin-lid, a bit of broken china, or a glittering fragment of glass. The difference seems to me to be one of degress, and that whereas the collector of old china is at the top of the long ladder of mental development, the raven is but a few rungs up it. But they have the same impulse in common, to carry off and keep the things they like.

My two ravens, Ben and Joe, gave me a considerable insight into raven ways. They were always prying and poking about for something to carry off, and among things I have seen them pick up and hop off with have been a vividly coloured marble, the stump of a yellow pencil, a bit of rag, the lid of a tin, pieces of broken china, a dry and whitened bone, a pretty leaf, etc. Much of their treasure-trove was hidden in the coal-hole, being thrust between the lumps of coal and then covered with bits of coal and any rubbish lying at hand. Smaller, and presumably more treasured, finds were secreted in special hiding-places in the yard wall. This wall was of soft grey sandstone, and they had no difficulty in drilling holes in it. The old mortar between the stones, and the soft stone itself, yielded readily to the onslaught of their strong beaks. In the holes thus made they hid any small bits of food not wanted at the moment, and any special finds, such as the marble or pencil-stump. The object to be hidden was pushed as far down the hole as possible, then any rubbish handy, such as leaves and straw, was used to fill the hole, so that the precious thing should be

well covered up. I have seen them put away object after object in this manner, but never forgetting to stop up the hole, which precaution was very necessary, as they loved to steal from one another, and never failed to take each other's food whenever the opportunity afforded—a loud screeching croak heard echoing from the back-yard meant that one of them had caught his brother in the act of raiding his special storehouse, and carrying off his greatest treasure. A chase round and round the yard then ensued, but they usually settled their differences quite amicably, and I never knew them have a serious dispute, let alone a fight. They were really an intensely affectionate couple, and would caress one another in the most loving manner, yet neither seemed to desire his brother to take his new-found toy, and I am convinced that when they hid their finds so carefully they were concealing them from each other. When Ben was lost (his clipped wing having moulted, he had acquired a new outfit of primaries, which feathers came down so quickly that the raven could fly well before I was aware he wanted his wing reclipping. On adventure bent, he flew away, only, alas! to meet with more adventure than he desired, and be shot by a keeper, who, seeing a large bird, shot it first, and inquired later what manner of strange creature he had slain), and Joe was left alone, the latter ceased to worry so much about concealing his finds. He still picked up and carried off all sorts of odds and ends, as he does to this day—at the time of writing he is

fourteen years old—but he now takes most of his finds up to his retreat on the top of the wall behind the coal. In this dark and malodorous corner he has his headquarters, and here his treasures accumulate. Bits of stick, straws, lumps of coal, tin-lids and so on, are piled up there. Occasionally I see him pushing something especially valuable into a hole in the wall, though now poor old Ben is not there to want the toy too Joe seldom worries to go to this trouble—the wall behind the coal, on the top of which he is in the habit of sitting, suffices as a storehouse now he has his domain to himself.

Once a find has been carried off and safely stowed away, he seems to lose interest in it. He may gloat over it in private—I cannot say ; I only know that it disappears and is seen no more. The bird is so intelligent in other respects that I should hesitate to say hidden objects are forgotten, but I should equally hesitate to say he remembers them for long. I see him play with his finds, put them safely away when he is tired of them, and with that pass on to something fresh.[1]

I have mentioned that this raven, and ravens in general, put away choice scraps of food, but I have no evidence as to whether their caches are intelligent provision for the future or no. My interpretation of their actions is that they hide the food just as they hide other finds, to keep it, and prevent their fellows and other birds finding it, but the odds are, especially if food is plentiful, that they will think no more of the hidden morsels.

[1] See Note p. 212.

However, if hungry, and if circumstances take them near the hiding-place, the association of objects will bring back to their minds and make them recollect the fact that they stored food here, when, of course, the food is brought out and eaten.

To return to mammals, and leave untouched the subject of foreign crows, many of which have the collecting habit markedly developed—the classical example is, of course, the bower-bird of Australia, which collects all sorts of pretty things, such as shells and bright stones, to decorate its bower—we find in the weasels (*Mustelidæ*) species that take home food, and others that never attempt to do so. The polecat and the domestic ferret will take food back to the nest if they can, ditto the stoat and the weasel—at least, when the nature of the kill permits them to do so—and the pine-marten hides food in any convenient crevice. A female pine-marten of mine used to take anything she was not going to eat immediately and carry it aloft, poking it into cracks in the roof of her place, or else into one of the several holes in an old tree upon which she was fond of playing. A beech-marten, likewise a female, would also put away food that she did not feel inclined to eat at once, but she usually took it into her sleeping-box. The otter and badger, however, both related species, do not, in my experience, cache their supplies. The otter's food, namely fish, is, of course, of a highly perishable nature, and does not lend itself to being stored. The same remark applies to much of what the

badger lives upon, for grubs, insects, wasps' nests, bees' nests, etc., figure largely in its bill of fare.

But the nature of the food may not be the real reason for the absence of the storing habit, as the cats, which live on a similar class of victim to other carnivores, do not take any heed of the remains of their kill once they have eaten their fill, yet dogs, foxes, wolves, and so on, bury the remnants if they can.

The fox invariably buries the remains of his kill. Having eaten all he wants, he carries the rest to some mole-hill, or other freshly turned soil, that affords good and easy digging, and here scratches a shallow hole. Into this he drops his treasure, scrapes the loose soil back over it, pushing it into place with his nose, and having more or less covered up the remains of his meal, he leaves it and goes off. I say "more or less," because the work is often badly done. Many such caches have I found, because, if a hen, a wing was left sticking out, or, if a rabbit, because a leg poked up. The work usually has a hasty and casual look. But it is not so casual that the fox does not remember it and return for that which he has buried. More often than not he comes back within a night or two, footprints on the damp soil telling how he dug up his goods. This is so well known to keepers, rabbit-catchers, and others, who make it their business to encompass the destruction of foxes by other than legitimate means, that they assert a buried kill is one of the best places to trap foxes.

The fact that the fox comes back for that which he has buried lifts his performance out of the purely instinctive category, but the act of burying food, at any rate in the first performance, must be classed as an instinct, as the following observation on a young cub will show. This cub, as explained in Chapter IX, came into my hands when but twenty-four hours old—a tiny, blind, helpless thing like a new-born kitten. She was reared by hand, and that with no small difficulty, and only by reason of constant attention. The result was that her smallest actions came under my notice, and things were noted which might otherwise have escaped observation. When between five and six weeks old she began to eat rabbit flesh, at first sucking and gnawing at the bones, and leaving them lying about when finished with, but at just seven weeks old she began to behave differently. The notes I made immediately afterwards run thus: "She tried to bury a rabbit leg, which she did not want, in her bedding. She scratched, then pushed it into the corner, and next went through the movements of pushing earth over it with her nose."

Now the fox-cub, at the time this was written, was a tiny toddling baby; she had never been out of doors, or seen earth, and having been hand-reared, had not been in contact with her own kind since she was a few hours old. By no possible means could she know anything about burying food, and it would seem that not only was the impulse to hide the rabbit leg a truly instinctive

one, but so was the manner in which it was done; the scratching, where a hole could not be dug, and the pushing with the nose, where there was no soil to push, denote a series of reflex actions, arising from the initial stimulus of the unwanted piece of rabbit, and independent of cerebral control, but which at every subsequent performance would be modified and controlled by an alert consciousness. It is superfluous to mention that this little cub had never known hunger, and could not possibly know what shortage of food meant; instruction by others of its kind being equally impossible. The incident was an extremely interesting example of purely instinctive behaviour.

It may be mentioned that after this "Toby," as she was called, often hid food in her bedding and in the corners of her sleeping-box, and that when provided with a tray of sand she cached her extra supplies in a most efficient manner.

From this evidence it is apparent that in the fox, as in the other mammals and birds we have considered, the storing impulse is instinctive, but in the adult fox is controlled and modified by intelligence and a good memory.

Another creature which exhibits the storing impulse is our good friend the dog. Most persons can bear witness to this. Who has not seen their favourite dog carrying off an unwanted bone to bury it in some quiet corner, and seen him scratch a hole, drop the bone in, and push the soil over it with his nose? Yet how many can add that they have seen the dog return later and dig the bone up

again? Nearly all the dogs I have known—and I have known a number of various breeds: terriers, spaniels, retrievers, sheepdogs, etc.—have been in the habit of hiding bones, and, though some of these dogs have been individuals of outstanding character and intelligence, only once have I seen a dog dig up a bone! And I am doubtful if it was not found by accident. I do not say that dogs never remember where they have hidden bones; I only state that the evidence is to the contrary, and therefore infer they generally, if not always, forget their treasures.[1]

Considering how well-fed the average dog is, this does not go for much, but then, considering how little need most dogs have to consider the morrow, the question is, Why do they hide unwanted food? For the same reason other creatures do so—to hide from their fellows and keep for themselves the things belonging to them. That this is the governing impulse was confirmed by the behaviour of a fox-terrier. She was a five-month-old puppy at the time this episode took place. "Tiny," as she was called, had been brought up with my tame otter, Thomas Romeo, the two being about the same age, and the greatest of friends. They had the maddest romps together, and were both fond of playing with a ball, apple, or other round object which made a good toy, but they always wanted each other's playthings. One day I threw a small apple to Tommy, who grabbed it, threw it in the air, and ran after it. The puppy dashed after it too, had it, and was off with it.

[1] See Note p. 212.

TOBY, THE FOX-CUB

She darted into the house—into the back-kitchen, to be precise—and ran to a corner, where a sack had been thrown on the floor, scratched at it, dropped the apple, made a pushing movement or two with her nose, and ran back to the young otter. Tiny obviously considered she had buried the apple, and had hidden it from Tommy.

Her behaviour showed not only a desire to keep the toy for herself, but how the caching instinct is fundamentally the same, and, in fact, the source of, the collecting impulse, in which non-edible things are involved.

It was evidently the urge to keep the apple that drove the puppy to hide it. Most dogs are content with bones, obeying an age-old impulse, an instinct arising from the long-ago period when the dog was a wild animal to whom a cache of food was sometimes useful. The burying of a bone by a dog seems to be as truly instinctive as the manner in which a dog turns round and round to make its bed, intelligence taking little part in either performance, and both being more or less mechanical. In this one particular the dog is below his distant cousin, the fox, for the latter seldom allows his memory to fail as regards a cache, the former more often forgets.

We have seen that the collecting, hiding, hoarding or storing habit, is found widely among vertebrates, to say nothing of invertebrates—to wit, the *Insecta*—and that it is exhibited by such diverse creatures as mice, voles and rats, crows and birds of prey, the fox and dog, and last, but not least,

by man. We have found that it varies in its manifestation from the haphazard nut-gathering of the squirrel, to the memory-controlled actions of the brown owl and fox. We have also seen that though it is usually food which is collected, there is another development of the hoarding impulse, best exhibited by the crows (excluding, of course, ourselves !), when unedible objects that are pleasing to the eye are carried off and carefully hidden. It has been shown, moreover, that in all cases hiding and hoarding is to be attributed to instinct, to an inherited impulse, the variations of which may be regarded as specific characteristics, to gratify which gives the creature much pleasure.

How such an instinct arose, what untold ages ago hoarding was first practised, we have no idea. It is obvious that once it had arisen it would be of utility, often of great utility to the animal practising it, and that natural selection would step in to perfect the habit. It is possible it began as mutation of the nervous system, for if you can have sudden departures from type with regard to colour and form, why not with regard to that mechanism of the nervous system which rules inherited behaviour ; that some animal in the dim far past began to put away its extra food in the casual manner the red squirrel yet does. Grant this, and there is ample material for natural selection to work upon. The side issue involved in storing unedible goods is obviously due to the greater intelligence of the creatures that practise it, their higher mentality enabling them to derive

pleasure from things of no utility. None the less their inclination to store is due to the impulse to hide food which has been perfected by the survival of those possessing it.

These remarks give us, however, no clue to the attitude of mind, to the outlook, to what the creatures *think*, that practise hoarding. We may take it for granted they do think, even the casual squirrel, and the forgetful bank voles, just as we think when we want to go somewhere and walk off. Our legs perform their function automatically, nevertheless we know what we are doing. The squirrel, we may imagine, feels a sensation of pleasure as it pulls a nut from the tree, a feeling it must do something with it, combined with a recollection of soft scratchable earth. Its scuffle to the ground, the scratching of the hole, will be as mechanical as our walking, though possibly its feeling of pleasure will increase as it drops the nut in. Yet so fleeting are its impressions, that by the time it has picked and buried two or three more nuts it will have quite forgotten about the first. Now the fox, we may assume, thinks too, but a good deal more. We may picture him having killed and partly eaten a well-fed rabbit, pausing to lick his lips, and sniff the night air. Is it too much to assume that pictures of his bed, of other rabbits waiting to be caught, of the soft damp soil the moles heave up, alternately come and go before his consciousness. Another look at the half-eaten body, another thought of a mole-hill, and he picks it up, carries it off, and inters it. The

manner in which he buries it, in which he uses his feet and nose, will cause him no more thought than the use of our hands to convey food to our mouths causes us, but all the time he will be aware, well aware, of what he is doing, and as he may return the next night, or several nights later, for his rabbit, we are forced to conclude he carries away with him a mental picture of the spot, a picture seen and smelt, in which the memory of mole-heaps, trees, and bushes is supplemented by a memory of the scents peculiar to the spot. That picture and many others will come and go alternately, until wiped out by later and more vivid ones.

Who can tell if these deductions are correct! But this is my interpretation from what I have seen of the way such animals behave.

NOTE.—April 1928. Joe is yet alive and well, and appears in the prime of life.

NOTE.—Since the above was penned so many persons have written assuring me that their dogs always return for buried bones, that I can only infer that I have been exceptionally unfortunate as regards my observations, but this does not alter the facts I have noted.

CHAPTER XV

NEST-BUILDING

THE nest-building impulse of the bird is part of a long series of instinctive actions that lead up to the great object of life—its continuation. It varies extraordinarily in different species. To take familiar examples ; it may manifest itself by the bird scratching a hollow in the ground and placing a few bits of rubbish round it, as the lapwing does ; it may take the form of collecting moss, lichens, and spiders' cocoons, to weave them, in the centre of some thick bush, into a wonderful oval ball, which is lined with hundreds of soft feathers, as is done by the long-tailed tit ; or it may show itself by the bird pecking a hole in the wood of a suitable tree, as do the woodpeckers ; or yet again the impulse may drive the bird, as in the case of the house-martin, to gather beakfuls of mud and make, with help of saliva as a cement, a mortar nursery under the eaves of the house ; or, to give one more example, the nest-making impulse may manifest itself in a water-bird, in the making of a floating platform of decaying reeds, the raft constructed by the dabchick, or

little grebe, being a good instance of the latter type.

Nests, in fact, differ as widely as do the birds that make them, varying from extreme simplicity to great elaborateness ; from the beautiful suspended cup of the gold crest, an exquisitely woven, if miniature, cradle, slung beneath the branch of a fir-tree, to the ledge, or crevice, in the rocks, which the razorbill uses without any attempt whatever at nest-making. But the barren ledge, and the beautifully made cup, are equally nests in the sense that they are cradles for the eggs, and nurseries for the young, and that they are the outcome of the specialized instinctive behaviour of the species.

The nest pattern of each bird is as truly specific as the length of its tail, the pattern of its plumage, the size of its foot, etc., and varies as little and as much. By that remark I mean that the nest pattern, though remarkably constant throughout a species, just as are colour and markings, may vary a little now and again, as do the physical characters ; but of such variation more anon. For the present it will suffice to speak of the nest-building instinct as being an unalterable one in each species. Every bird builds according to convention, according to the receipt that is ingrained in its organization, and from which it appears to be unable to escape.

In connection with the fact that the nest-building impulse is part of the organic make-up of the bird, it must be noted that allied species show their common origin in similar nests. Our homely chaffinch and the brambling of Scandinavia are

nearly related species, though differing considerably in colour and markings, the pinks and greys of our cock chaffinch affording quite a contrast to the tortoiseshell of the beautiful little male brambling ; but when we come to the details of their nests and eggs we find a great similarity. The eggs, to begin with, are almost indistinguishable in colour and markings, and the nests are much alike. We all know the exquisite cup the chaffinch makes, woven of moss, and decorated with lichens and spider cocoons ; well, the brambling's is so similar that it might be mistaken for it, though in Norway, where the nest is usually built in the fork of a birch-tree, silvery shreds of birch-bark are frequently added, an adornment I have never seen used by the chaffinch.

Now, in writing of the nest-making impulse, I have spoken as if the bird that builds a nest was driven by one desire, a single impulse, or instinct, but a little reflection will show that the construction of an elaborate structure like the chaffinch's nest, or the wren's, or the thrush's, was not the work of a moment, but that it has taken many days, even weeks, to complete. The making of, say, a magpie's elaborate structure of sticks and twigs, keeps the birds busy for quite a period, for they begin on it a month or six weeks before it is required. Even a thrush's nest is not put together in a minute, or even in a day or two.

With the object of getting some idea of the labour involved in the construction of what we may regard as a typical nest, I carefully dissected a song-thrush's.

It was a new nest, and was in no way exceptional, either as regards amount of material, size, or shape. It was made of dry grass, with one or two leaves and twigs, and was strengthened with damp earth and lined with rotten wood fibre.

Pulling it to pieces bit by bit, I obtained 1,610 pieces of grass. This does not mean that I obtained 1,610 fibres of grass, for the small pieces could not be counted individually, and had to be picked up in little bunches, as the bird would pick them off the ground, so the actual number was much greater. The 1,610 would represent 1,610 "pickings up" on the bird's part!

Besides this there was a large handful of damp earth, stuck together fragments, and the clay cup, lined with rotten wood fibre, that made the actual cradle. There were several hundred long fibres woven and welded into the earthen cup, which I did not pull out of the soil that mortared it all together. The interior was beautifully smooth, and the edge of the nest was of carefully woven grass. The whole was an elaborate piece of work.

An even more wonderful nest was that of a long-tailed tit which I examined. Here are the particulars of it: An oval ball of moss, lichen, and spider cocoons, 12 inches in girth, and 14 inches in circumference vertically. Weight exactly 1 ounce. Entrance effected by means of a tiny hole, through which could be seen that it was lined with feathers. The walls were a thin, but strong and elastic felt of moss and spider silk. Pulling the nest to pieces, the following material was disentangled: six small

THE WONDERFUL NEST OF THE LONG-TAILED TIT

oak leaves, sixteen gorse seeds (the nest was built in a gorse bush), 1,144 feathers, partridge, fowl feathers, thrush, those of small birds, and jay's feathers being noted among others, besides which there was rabbit fur. There was much fine moss, some fine and short bits of grass, and spider silk that must have represented many thousands of cocoons, the walls being practically made of silk; with, in addition, the decorative lichen that covered the outside of the nest.

It was a most marvellous example of bird industry and achievement. Many thousands of actions must have gone to its making.

From this it will be seen that when we speak of the nest-building instinct we are employing a far too limited expression, for it would better fit the facts to speak of the nest-building series of impulses. The course of actions needed to make a nest covers weeks, at any rate in the majority of instances, especially in the case of nests which are nests and not merely resting-places for the eggs.

At this point I can picture the reader, who has observed how I have stressed—unduly emphasized, he will probably assert—the intelligent aspect of the behaviour of mammals and birds in many other respects, asking if the whole of the nest-building behaviour is to be considered quite mechanical, if intelligence has no part in the performance.

Careful observation has led me to believe that the "man at the wheel" is more or less a looker-on, and that he has little to do with this long series of complicated actions, though now and again he

may give the steering-wheel a turn and guide the bird a little on its course.

In illustration of the fact that nest-making is almost entirely a question of inherited aptitude, take, not only the fact, already alluded to, that the individual builds in accordance with the pattern peculiar to its species, but also such vagaries of instinct as lead starlings to pile nesting material into what, for them, is a bottomless pit. An instance came under my notice of a pair of starlings that, finding a hole in a shuttered window that gave access to a dark loft, began to take in nesting material—grass, straw, feathers, etc.—which they dropped through the hole. Exactly how long they had been at work was not known, but several weeks at least, and when the door was opened a sackful of rubbish was found on the floor beneath the window—more than enough to have made a dozen ordinary nests. It seemed as if they would have gone on indefinitely. Apparently, having chosen a nest hole, their impulse was to fill it with nest stuff, regardless of the fact that it could not be filled. A touch of intelligence would have shown them the task was hopeless, but " blind instinct " drove them on and on, mechanically responding all the while to the ever unfilled space.

In the same way jackdaws will make the greatest nuisance of themselves filling chimneys with sticks, though in ordinary affairs they are brainy and intelligent birds, as also, for the matter of that, are starlings.

An interesting feature of the nesting habits of

the starling and jackdaw is that their nest-building is an instance of an instinct persisting after it has ceased to be of use. Most birds that hide their eggs in holes, whether in trees or in the ground, do not bother to make a nest—witness the owls, the kingfisher, etc., but these two have only lately, as evolution goes, deserted the open trees, where their relatives still build among the branches, so they carry on the tradition of nest-making, as a cradle for their pigmented eggs—another relic of when they nested in the open, birds that nest in holes generally laying white eggs.

This is indeed evidence of the essentially mechanical nature of nest-making behaviour, for here we have a bird persisting in it after it has ceased to be of any use, and the habit persisting in the same way, and to the same degree as a character admittedly physiological, namely, the pigmentation of the eggs.

If any further evidence on this point were needed, we could, of course, refer to the well-known fact that the young bird in its first season, absolutely unexperienced, produces a nest with *almost* the same ease and facility as the most experienced, and equally true to type and pattern. It has been argued that as regards the latter, it may be influenced by the memory of the cradle in which it was reared, but even if the nestling, whose one thought in life seems to be its next meal, did note how the nest was made, how it was woven of grass and lined with clay, can we believe, in view of all we know of the mentality of birds, that it carried a clear

recollection of the structure in its mind for twelve months! No, we cannot credit that.

Before considering the question whether, after all, intelligence does play any part in the nest-building behaviour of birds, it may be useful to pause a moment to consider how this sequence of instinctive actions has been evolved, and how it originated. In another connection we have seen that the idea of instinct being crystallized habit may be discarded as being untrue, so any theory that nest-making originated intelligently, became habitual, and then instinctive, may be likewise discarded as not in accordance with what we know about other instincts. If the theory put forward in this book is correct, namely, that instinct is elaborated reflex action, then we must look back many long æons for the origin of the nest-making impulse. Birds, we know, have affinities with the reptiles, and the oldest known birds (*Archæopteryx*) of the latter part of the Jurassic period approach the reptiles yet more nearly. Our modern reptiles and birds are probably descended from a common primitive ancestor, an ancestor that, we may hazard a guess, laid eggs, which it placed in a hole scraped in the sand, as so many reptiles still do. In that hole in the sand we almost certainly have the beginning of nest-making, the beginning of the elaborate instinctive behaviour selection and evolution have built up.

Once the ancestral bird had taken to incubating her eggs, and not leaving them, reptile-wise, to be warmed by the sun, the next step would be to

pack grass and other material around her as she sat. All nest-making seems to be based on that, on the principle of building up a wall, the nest-making bird sitting in the middle and placing the stuff about her. Even a primitive nest like that must have been of great biological value, enabling the individuals that built it to keep their eggs warm and hatch out a larger percentage than those whose eggs were more liable to get chilled. The instinct, once acquired, would certainly be of survival value, as would any improvements on it, especially those variations of the instinct that moved it back from when incubation had begun to when the eggs were being laid, and again prior to that, when the nest was built in preparation for the unlaid eggs.

Since then nest-making has, in many species, become a function of both sexes, the pair working together to make the cradle of their prospective family, and with this sharing of the labour has come about the involvement of courtship and nest-making, the two being often inextricably mingled; for instance, in the grebes the actual pairing takes place on the nest. The male whitethroat, that arrives in England a week or more ahead of the female, and straightway takes possession of a certain area of hedgerow and undergrowth, where he proclaims his whereabouts by singing continuously, has taken the first step in nest-making, for he has secured a territory where he and his mate will be able to make a nest uninterrupted by others of his species.

The fact of the matter is, as has been pointed out before, that the long series of actions that the bird performs from the time it begins to travel back to its nesting-place, through courtship, pairing, nest-making, rearing of the young, and launching them into the world, is a continued sequence, all tending towards the great end, i.e. reproduction, and no one of which can be properly separated from its predecessor or its successor.

And now we come back to the point we have approached several times : During this long sequence of instinctive actions is the bird an unthinking automaton, moving it knows not why, in response to the behests of its nervous mechanism ? Or, to put it differently, is the " man at the wheel " an unconscious sleeping passenger ; or is he a fully aware one, alert to what is taking place, yet unable to alter the course of the car ; or is he more or less in control, with a hand on the wheel, turning it when the situation so requires ?

We can only answer, or attempt to answer, these questions by seeking evidence of the presence or absence of intelligent behaviour at the nest.

The case of the swans that nested on an islet below the English Bridge at Shrewsbury in 1913, already mentioned in Chapter II, is interesting in this connection, especially as the facts were recorded by that careful naturalist, Mr. H. E. Forrest ; they are so valuable, indeed, that I think it will be as well to repeat the account already given in greater detail. But before proceeding further I must mention that the nest-making of the female swan

is of a primitive description, consisting of gathering a pile of rubbish around her. Here is Mr. Forrest's account of the way this pair had made the very nest that became endangered :—

" They were at the lower extremity of the island " (February 14, 1913), " one on the water, the other on the land. The latter was squatting on the ground at its highest point, but although its body was motionless, its beak and long sinuous neck were extremely active. It kept incessantly reaching out in every direction and seizing some piece of dead herbage or other material, which it placed against its body. Each piece was placed in a different spot, and thus it gradually built up a wall round its body, and exactly fitting its shape . . . there being no attempt at weaving the materials together."

It was nearly three months later, i.e. May, when the troubles of the swans, which now had six eggs in the nest, became serious, for the flood rose higher and higher. " As the waters of the Severn encroached the birds collected twigs and any other materials that were available to raise the nest. Assisted by humans—who kindly threw down bales of straw, and when the mass was threatened with being swept away secured it to the bridge with ropes—the birds have succeeded in outriding the storm, although it is believed some of the eggs are missing." (*Shrewsbury Chronicle*, May 2, 1913.)

As a matter of fact, the remaining eggs were spoilt, and the swans had eventually to abandon them ; but the point that interests us here is that the birds showed such ability to cope with an unusual situation.

A spider interrupted in making its snare is such a slave to cast-iron convention that it cannot resume its task, but must begin again from the beginning; but here were the swans, not only trying to raise their nest with natural material so as to keep the eggs above water, but actually making use of bundles of straw. It might be possible to explain their behaviour in terms of stimulus and response, but to do so appears to me a wilful blinking at the intelligent aspect of their actions, at the intelligent adoption of the means at hand, the making use of the bundles of straw, to the need of the moment, which was to keep the eggs above water. We need not suppose the bird thought out the situation as a human being would have done, but it was certainly no mere mechanical response that made her take the straw —there was perception and contrivance in it. The "man at the wheel" was certainly on the alert to seize any chance that offered.

This brings us to the question whether experience modifies the nest-building instinct, and whether intelligence has any say in the construction of the nest. We have seen that instinctive behaviour in the higher creatures, i.e. birds and mammals, is almost always accompanied by awareness. The individual may find itself performing an action "without thinking," but it is conscious of its performance, it is not a sleep-walker, and is aware of what it is doing. This awareness means a memory is registered, and can we doubt that memory will affect the creature's behaviour next time it is called on to repeat its performance?

THE MOORHEN AND HER NEST

It is difficult to *prove* the effect of experience on nest-building, but it is noteworthy that birds spend much longer over the construction of the first nests in the spring than they do over those they build for later clutches of eggs. When a thrush, for instance, has launched its first brood into the world, and begins a second nest, the last one is soon made, a few days sufficing, whereas the first took a couple of weeks to make.

A very useful bird, from our point of view, is the moorhen, for it is a great nest-builder, and is not content with building a nest for its eggs, but erects special platforms for the young to roost upon; hence my calling it a "useful" bird, for it affords so many opportunities for observation with regard to the nest-building habit.

It begins building early in the season, making a platform of twigs, rushes, leaves, etc., in the reeds at the pondside, or in some waterside bush. Both cock and hen add to the platform, the contributions of the cock often being brought in a way and with a manner that suggests he considers them offerings to her. He will climb on to the nest, put a piece of rush down upon it, squat down and place it in position, then stand up again, and spread his tail and bow towards his mate; or he will bring the material and hand it to her as she sits upon the nest, swimming off with a pleased appearance as if he has done something to be proud of, and with a purposeful air very impressive to the watcher. So the nest grows, not only during the nest-making period proper, but after the eggs are laid and

incubation has begun. The moorhens are adding to it all the while. By the time the young are hatched it is a considerable structure, but even then it is not finished with. Though the chicks are very active, and able to swim and run as soon as their down is dry, they continue to use the nest as head-quarters. But not content with this nursery, the parents make other platforms, pulling down rushes, picking up bits of reed, and piling on it leaves, etc., so that the chicks may rest high and dry without going home every time they are tired. These supplementary nests are not so well made as the original, but they serve their purpose admirably, and watching the birds and noting their behaviour, with its purposeful intelligent appearance, one is driven to ask oneself, " Is this entirely instinctive ? " My interpretation is that on a foundation of instinctive response, experience and intelligence have built up an additional structure of " sensible " behaviour ; that when the moorhen puts together an extra platform for the use of her chicks, she does it because she wants to, not because she acts like a sleep-walker without any conscious volition.

With reference to the question of material being added to the nest after it has more or less served its purpose and the young have hatched, there are the interesting cases of some of the birds of prey, notably the golden eagle and the buzzard, both of which are in the habit of bringing fresh greenery to the nest after the young are hatched. I have seen quite a big spray of mountain-ash lying on the side of a buzzard's nest, which nest contained

two big young ones. It was fresh and unfaded. Withered sprays were also lying about. It is easy to say " the bird's instinct prompts it to bring the greenery," but if the bird acts consciously the " man at the wheel " may be in control.

It is indeed difficult to know when he takes a firm hold of the wheel and when the mechanism runs on its own, but we may be fairly sure that he is not content with the rôle of passive passenger ; and that it is intelligence which leads a robin to make use of an old tin as a nesting site rather than its time-honoured nesting place in a hole on some bank, or a wren to incorporate strips of paper in its nest, together with the moss and leaves its custom ordains for it ; here we have the man in control giving the wheel a decided pull.

This brings us to the question which has faced us throughout this chapter, namely, What is the mental state of the average bird, say a blackbird or a thrush, when it sets to work to build a nest, and during the construction of that nest ? And the reply we hazard is that the bird about to build a nest feels vaguely uneasy ; it feels it wants something ; it pecks and pulls at stuff around it, not with any foreknowledge of nest-making or the use of the material, but because it pleases it to do so. The material in its beak will act as the stimulus to further desires, the desire to pack the grass, or moss, about it, and so on. But with every action experience is being added to the mental equipment, and what at first was a meaningless want to the bird, on repetition will have meaning, and its desires

will have the backing of purpose ; in fact, from its actions being purely instinctive they will become governed by purpose. Yet if our reading of the bird's actions are correct, and our surmises concerning the nature of instinct are accurate, at no time during the construction of its first nest can the bird have any preconception of what its completed nest will be. There cannot be any mental image of the nest as a nest. It must just work on because the performance of the actions satisfies it and gives it pleasure. It pleases it to pick up grass and moss and build up a wall around it ; it undoubtedly derives great enjoyment from the work, and would be miserable if prevented, so that as the task proceeds its joy gets greater and greater. When you have watched birds engaged in nest-building, or sitting birds putting straight bits about their nest, you cannot doubt the satisfaction they derive from it. Their whole air breathes gratification and contentment.

We therefore assume that the nest-making bird acts largely mechanically and without thinking, that it has no knowledge of the end to be attained when it sets to work for the first time, but that it remembers what it does and the results of its deeds, and modifies its actions by the teachings of experience, so that intelligence, after all, has a part in its behaviour, greatly as that behaviour is dictated by instinct.

Hence we must picture the nest-building bird as acting literally on the spur of the moment, with little or no looking ahead, but little looking back,

living in the present, gratifying the momentary desire, and driven hither and thither by impelling instinct, the satisfaction of which fills its being with exquisite pleasure, yet not without purpose and intelligence, that purpose and intelligence summed up in the saying " Live and learn."

CHAPTER XVI

THE MIND OF THE HUNTER

IN the mind of the hunter we have one of the most interesting of the problems set us by animal behaviour.

So many creatures hunt and kill, so many are hunted and killed, life lives on life, and "slay and be slain" seems so much the motto of Nature, that the poet's dictum of "Nature red in tooth and claw" would seem the right one after all, and leads one to recoil in horror from this system of carnage.

We are brought up against the cruelty, or alleged cruelty, of Nature, the ravening beasts preying on other animals, the fierce birds of prey striking down innocent thrushes and pipets, and so on. But to get a clear idea of the mind of the hunter we must remember that there is no practical difference, save in our sentimental valuation, between a peregrine falcon flying at and striking a grouse, or a merlin pursuing and capturing a meadow pipet, and a flycatcher taking flies or a swallow catching gnats. All are living by taking life, highly organized life too, not the vegetarian life on which the herbivorous creatures exist. The robin picking up a worm from

the garden path, the bat chasing flies upon the evening air, or a duck slug-hunting among the dewy grass, are, in essentials, acting in precisely the same way as the cat which catches mice, the tiger that kills deer, buffalo, or even men, and the stoat that runs down a rabbit—all are taking life.

Yet to our human mind the former appear most commendable, and the latter cruel and bloodthirsty.

I have no wish to enter here upon a discussion on the ethics of killing, but merely to clear the way for a consideration of the mind of the hunter, though it is necessary in this connection to point out that, considered as a species, man is the most murderous creature upon this globe ; not only does he slay terrific numbers of animals for food, but he also destroys great numbers for pleasure. As a killer our race has indeed surpassed all other species.

For this reason alone our horror of the predatory birds and beasts is an affectation of which we have no reason to be proud, and in approaching the problem of the mentality of the hunter, we must first divest ourselves of any false sentiment, and any preconceived idea regarding the cruelty of carnivorous creatures.

As a matter of fact, it is only man who rises to the heights, or descends to the depths, whichever way you like to put it, of intentional cruelty ; it is only man who intentionally causes pain, and we may safely say that Nature is only accidentally, never purposefully, cruel. The cat playing with a mouse may seem to us the personification of cruelty, of torture, but she is not. She lets the mouse run

away from her, and then springs upon it, just when the unfortunate victim seems to have got away; and so she goes on, until the miserable mouse can run no longer, and we hold up our hands in horror, crying how dreadfully cruel the cat is. We forget that the cat does not mean to be cruel. She has no realization that she is inflicting pain, and she would play with a bit of string with just as much vim and joy. She is simply playing with the mouse, and though, from the mouse's point of view, that may not make any difference, it makes a good deal from ours, when we are trying to comprehend the working of the mind of the hunter. In approaching the behaviour of cats, weasels, stoats, owls, hawks, eagles, etc., let us put completely aside any question of cruelty, or any idea that these creatures act with any purpose of inflicting pain, when we shall be able to view them, unbiassed and in a friendly, instead of an inimical spirit.

If any one creature can be regarded as the embodiment of "The Hunter," I think it is the weasel. Its quarry is but small, namely, field-mice and voles, yet it is a "mighty Nimrod" in its small way. The following is a description I wrote of a weasel at work, for my *Wild Life Studies*:—

"When really bent on the chase, a weasel is deaf and blind to all else, and it hunts mice and voles with a grim determination that does much to keep these prolific rodents within bounds. No wonder the unfortunate mice quiver and try to shrink away when the pattering of strange feet is heard in their burrows. Woe to one whose trail is picked up by

A MIGHTY HUNTER—THE WEASEL

the hunter! No pack of hounds on the scent of a fox was ever half so deadly as this little atom of flesh, fur, and devilment. The mouse may have bolted for dear life, but that makes no difference. With his keen nose on its trail the weasel follows; through all the turns and twists of the underground tunnels, where mouse holes run into mole galleries, and up again to the light of day, he hunts the scent. However complicated the line of that mouse, however the scent may have been crossed by other mice, he will patiently work it out, and hunt on through the labyrinth of the underground world to which the small creatures of the hedgerow have entrance. Those who enjoy sport, those who have ridden in a fast gallop with hounds, those who have had the primitive hunter roused in them, will understand something of the entrancement and blindness, to all but the chase, which possesses the weasel as it runs on, now hunting slowly, now galloping ahead, taking the line from tunnel to tunnel, and finally to the upper air. We must then picture the chase being continued along the runs and highroads that thread the herbage, the hurried bewildered rush of the hunted mouse along the shadowy paths it knows so well, until, in its panic, it dashes blindly on into unknown ways; yet the relentless pursuer is getting nearer all the time, save when a break in the scent delays it for a moment. Then the weasel shows what a hunter it really is, for as a huntsman casts his hounds when they have lost the line, so does the weasel seek to recover the scent by dashing round in a circle. It is rarely indeed that he does

not recover it and dart on once more upon the line. Now it is, with the end near, that the hunted mouse will do all sorts of desperate things, but the Nimrod on the trail is oblivious to all but the scent, and will follow wheresoever the quarry leads. Several times I have seen the chase crossing a wide road—a most fearful desert of danger and desolation to these small creatures—and instances have been known of hunted and hunter taking to the water. Once within sight, and all is over; the weasel bounds upon its victim, and with a quick bite ends its career."

Now the above is, I think, a fair and accurate account of a weasel hunting down its prey, and I would especially draw the reader's attention to the absorption of the hunter in its task. Stoats, weasels, and other creatures that run down their prey become so intent on their task that they are regardless of all else. I have had stoats chase rabbits to my very feet and never know I was there. It is common knowledge that hawks, in the ardour of the chase, will dash after birds into outbuildings, and even houses. Such instances could be multiplied indefinitely, all going to show the absorbing nature of the pursuit, and how every sense is concentrated upon it.

Hence the first result of our inquiry into the mind of the hunter is to show how it concentrates upon the chase, how every sense is brought to bear upon the hunt, and that it has neither eyes, ears, nor nose for anything else. The desire to catch the quarry dominates the weasel—which we are regarding

for the moment as the typical hunter—to the exclusion of all other emotions and desires, even to the exclusion of fear. That this enthusiastic concentration is pleasurable we cannot doubt; some idea of the emotion of the chase can be gained by considering our own feelings under like circumstances. Those who partake in field sports may have some idea of it, especially those who indulge in fox-hunting and know what a good hunt means, a fast run, when one is only conscious of the fleeing moment, of the flying hounds ahead, and the anxiety not to lose them, and the concentration of every sense on the hunt.

But this artificial excitement is, after all, by no means the same thing as the primitive impulse that drives the weasel on. The impulse to go after its quarry is deeply implanted in every predatory beast and bird, the impulse to chase being truly instinctive, though, as I shall show presently, the predatory birds and mammals are highly educatable, and for their success in hunting depend largely on experience; the carnivorous creatures, taking them as a class, are of a high mentality, far higher than the insectivores and the herbivores.

For the moment, however, we are considering the hereditary disposition to hunt, which instinct is found in all the hunters, every one of which will pursue suitable quarry without previous education, though such first essays are not necessarily successful ones.

As examples of this inherited disposition, I will take first young merlins, then eyass sparrow-hawks, and lastly the fox and the otter.

My experience of merlins has been gained with eyasses taken from the nest before they could fly and hand reared, being therefore deprived of the example, and precepts (if such are given !) of the parent birds. Until they are fully fledged and strong upon the wing they take no notice whatever of other birds. Indeed, one can safely let them fly about loose for ten days or more after they are upon the wing, confident that they will not kill for themselves, or fail to come and feed upon the meat put out for them. This corresponds to the period during which the young hawks would be flying around under the charge of their parents, and would be fed by the old merlins. But towards the close of this period, during which the eyasses have been rapidly maturing, a great change comes over their disposition. Previously if a small bird had passed close to one of the young merlins it would not, however hungry it was, have attempted to chase it. If a wild hawk, it would merely have sat and screamed for its parents to bring it food ; if a tamed one, it would have returned to the " hack board," i.e. the feeding place, to see what it could find. Now the situation is changed, different factors come into play. When a finch, or sparrow, or pipet, passes suddenly near the young merlin, it dashes after it, in hot pursuit. The first chase is nearly always the result of a sudden happening—the hawk is after the quarry " before it has time to think." I have seen this happen several times with merlins, also with young sparrow-hawks. Take Shrimp, the jack merlin alluded to in another chapter, as

a case in point. He had become very tame, but so far had shown no interest in his legitimate quarry, so one day I carried him out into the stubble-fields to look for a moulting lark. One flew up suddenly almost beneath the hawk, which in the same instant was off my fist and dashing after it, pursuing it up into the air, and endeavouring to get uppermost so as to be able to stoop upon it from above. The lark was too quick, diving headlong into a hedge, the hawk dropping after it in a stoop that came too late; but Shrimp had demonstrated unmistakably that it is an hereditary instinct, brought into play by the bird fleeing from it, which sends the young hawk in pursuit of its first quarry. The impulse is quite independent of consciousness and intention, though on future occasions both will come into play. Next time Shrimp watched the ground eagerly, and held himself in readiness for a lark; but I must add, to show the part played by intelligence, that the country where I was flying him was thickly wooded, and the merlin was so often disappointed, his birds usually getting into cover and eluding him, that he soon lost interest, and refused to fly at any quarry, at the most only chasing a bird a few yards, then giving up and flying off home, where, when I returned, he would fly down to meet me from the housetop. Could any example better illustrate the superstructure of intelligent behaviour, on a foundation of instinctive response?

Later, Shrimp was given full liberty, being turned out "at hack" during the day, and only brought indoors when the weather was bad. He had ample

opportunity to kill for himself, but, having learnt I would feed him twice a day, he never did so. Instinct was indeed controlled by experience.

With regard to the sparrow-hawk, a much more highly strung and impulsive bird than the merlin, a hawk that is a veritable bundle of nerves, and a complete contrast to the easily tamed placid merlin, it too behaves in a similar manner as regards the initial essays in pursuing quarry. To start with, the eyass views birds that jump up beneath her with utter indifference, but there comes a stage in her development when the flutter of a blackbird rising near pulls the trigger of instinct and sends her dashing in headlong pursuit. Bessie, a young sparrow-hawk I reared and entered to blackbirds, at first took no interest in other winged creatures, then I saw her watch a thrush, so took her to a root-field, and walked backwards and forwards until a blackbird fluttered up close at hand. The hawk was gone in the same instant, a flash of brown following a flash of black being all I saw as she hurled herself in pursuit. Hawk and quarry dived headlong into the fence, the tinkle of Bessie's bell guiding me to the spot where she was gripping the unfortunate bird after the manner of her kind. Henceforward she watched for birds getting up, often "bating" from my fist at the stirring of a leaf, in her keen anticipation that one was going to rise.

So much for the hereditary impulse of the hawks; but turning to mammals, to the highly intelligent ox and otter, we find the same thing, that their

hunting abilities depend on a fundamental impulse, independent of intelligence, which leads them to chase that which runs away from them. Take Toby, the hand-reared fox-cub, brought up by me from two days old, so quite without any parental education. She was intensely playful, always dancing after something or other, and would stalk a bit of paper tied to a string like a "born hunter." She would step cautiously, slink towards it, and when it was jerked away pounce upon it and worry it. But it became serious when she displayed the same tactics in an advance upon the tame wild ducks, and only quick intervention prevented trouble; while she pursued everything that ran away from her.

My otters are the same; anything that runs must be chased. The cats are afraid of them, and usually bolt at the sight of an otter, when the otter is after them like a flash, but so long as the cats stand their ground the otters let them alone. And I have often noticed Tom, the dog-otter, dash after a passing bird. As certain as a bird flies near, Tom springs towards it and races after it. He must know perfectly well that he cannot catch it, but the impulse to pursue seems irresistible.

This impulse to pursue is undoubtedly, as already remarked, at the root of all hunting behaviour. It is a fundamental instinct, from which we cannot claim exemption, and at its initial performance will carry no meaning with it. The first time a hawk dashes after a bird it does so "without thinking," and we are probably not very far wrong in assuming

it is merely conscious of a pleasurable sensation at chasing something, but when it grabs the bird, and finds it has good food in its talons, the situation is not only altered, but will never be the same again. Henceforward intention will enter into its behaviour, and the " man at the wheel " will assume more and more control as experience and memory come into play—witness Shrimp, the merlin, who learnt that hunting was not worth the trouble.

Now as the gratification of instinct is always pleasurable, for the organic machine moves so much more easily in the direction in which evolution has designed it to go than in any other, we may, in considering the mind of the hunter, first assume that the predatory beast or bird thoroughly enjoys hunting, that as it answers to the urge its emotional tone is raised, pleasurable excitement surging through its being ; then we know that this same excitement becomes so great that all save the chase is excluded from its consciousness, and it barely knows where it goes (hawks dashing into buildings, etc.) ; while every sense, and in particular its intelligence, is brought to bear upon the hunt, and to gratify the desire to catch the quarry, hence it stalks the victim, or races after it, with a grim determination, and a keen eye for overcoming difficulties, that we do not find in the creatures whose food is more easily obtained. The carnivorous birds and beasts are all of a high mentality, but this shall be gone into presently, when a little more has been said about the state of mind of the hunter. That endeavour to catch its quarry is sometimes spoken

of as bloodthirsty, as lust for blood, lust to kill. It is certainly a fact that all predatory creatures enjoy making a capture, and equally certain that they enjoy the feast that follows. But to think of them as enjoying the taking of life is to place their powers of thought and of forming concepts on a level with our own. As I have said earlier in this chapter, for deliberate cruelty, for deliberate purposeful murder (I use the word "murder" to denote useless slaughter), you must turn to man. Nearly all slaughter in Nature is to satisfy hunger. Occasionally a lively weasel—I am here using the word "weasel" to cover the *Mustilidæ* and include such animals as the otter and pine-marten—will in sheer playfulness pursue and kill more than it requires, just as a fox that had found entry into a fowl-pen would kill all the fowls it could. What in ourselves we should term the "sporting spirit," and what in the animal we will describe as the impulse to slay, impels it to grab everything within reach, to make the most of the exceptional opportunity. But such a chance is exceptional; normally it only kills after an arduous pursuit or long careful stalk, when the quarry is eaten, and if sufficient for the immediate needs of the hunter, it does not worry again. With a full crop, or a full stomach, all urge to hunt has gone. You may then see the sparrow-hawk sitting motionless on some tree branch, while small birds pass unregarded about it; or the fox slinking quietly off home without turning its head to look at the feeding rabbits.

As regards the higher mentality of the predatory birds and beasts, it is, of course, obvious that a rabbit which merely has to nibble grass for a living can exist more easily than a fox or stoat which has to hunt down and kill something before it can dine. It is equally obvious that an owl which has to find and pounce on mice will have more difficulty in making good than the swallow that has but to catch the flies dancing about it in the air. The hunters have to match their wits against other wits, and exercise a nice discrimination in what they do. No cast-iron convention will help them to get a supper, only judgment and wily cunning. Hence it is that the predatory birds, and the carnivores among mammals, represent the *intelligentsia* of the animal world. I know but one exception to the above generalization, and that is the common rat, a creature of most alert mentality, yet a rodent, but then in habits it *is* carnivorous, for no hunter is more ruthless than a rat when it gets the chance to kill; so we come back to the same conclusion: it is the hunters that have the "brains."

CHAPTER XVII

THE HORSE

THE horse affords a good example of our tendency to think well of creatures that we know. Next to the dog and the cat, it is the animal most intimately associated with man. Its history has been identical with ours since the prehistoric period. When precisely it was domesticated is lost in the unchronicled eras of the Stone Age. It may have come under the domination of man even earlier. All that we can say with certainty is that equine bones have been found associated with human remains in prehistoric deposits.

If we cannot state anything positively about the domestication of the horse, we can safely affirm that it has been under human control for a time that is lengthy even with regard to the alteration and modification of species, and that during this period it has undergone a process of selection which has produced vast alterations in it. Many types have been evolved, so different from one another and from the original ancestral form, that it seems almost incredible that the English thoroughbred,

the Arab, the Shire horse, the Suffolk Punch, the Percheron, the Shetland pony, etc., etc., could one and all have descended from a donkey-like beast of the Prejvalsky's horse type, and that they had a common ancestor.

Yet the evidence renders it practically certain that this was the origin of these diverse breeds.

At this point the reader will probably wonder what the descent of the horse, and its evolution from a primitive type of pony, has to do with the mind of the modern horse, of the race-horse, the hunter, the cavalry horse, the vanner, the cart-horse, and the pony, down even to the Sheltie on its native wind-swept islands.

It has a good deal to do with it, for you must bear the evolution of the horse in mind if you are to get a true understanding of the mentality of this "friend of man"; you must also bear it in mind if you are to grasp the fact that the horse is a much misunderstood beast, and mentally a much over-rated one. From the very dawn of history and of literature the horse has been a prominent figure in legend, myth, and poetry, sharing with the dim and distant heroes the glamour of their deeds; and so on, down the ages, we find the horse linked with noble and gallant figures, a participant in heroic deeds, to modern times, when it is not only a hard-working slave, but is the central figure in sport.

No wonder that love and gratitude, if not always consciously, have woven a halo of romance and sentiment round the "gallant horse," the "sagacious

beast," the " noblest friend of man," that has quite obscured the animal as it really is.

When we come to consider carefully the behaviour and mentality of the horse, we find that it exhibits little real intelligence, but is largely the slave of unreasoning impulse, combined with a docility of temperament, and a readiness to form habits, that has gone far to make it what it is, namely the most useful servant of man.

Nothing could illustrate better what a creature of impulse it is than the shying trick. If a horse is given to shying, no amount of coaxing or of punishment will cure it. A leaf stirring in the fence, a little bird flitting out from a bush, a white pebble on the bank, or some other insignificant thing, will cause it to swerve across the road, probably snorting as if in fear. Bad sight has nothing to do with this annoying habit, for the horse takes alarm at almost invisible things. Of course some horses do shy at bigger objects—a log by the roadside, a heap of stones, and so on. In the latter case the culprit will shy at the same heap of stones, or whatever it may be that it objects to, day after day, darting aside with as much alarm at the end of the week as it did the first day it saw the heap. No familiarity with the thing will prevent a shy. That shying is correlated with good feeding and high spirits cannot be doubted, for overworked and underfed horses are seldom guilty of it, but this does not alter the fact that the shying horse jumps aside "before it has time to think," and without using its wits with regard to the thing it jumps from.

This has been referred to elsewhere, when writing of the survival of instinctive behaviour in domestic animals, and certainly the conduct of the horse does look like a wild instinct directed towards the avoidance of predatory beasts. The sudden panic at "nothing at all," or at any rate at something which to us does not seem terrifying, which leads to bolting and galloping off, appears to be of similar origin, and a survival from ancient times.

No creature panics more hopelessly than the horse, from the single runaway to a bunch stampeding. Horses lose their heads utterly and completely, and flee blindly from the alarm. They seem to be entirely at the mercy of the impulse to bolt, and when under its influence to be incapable of any other thought. In moments of difficulty they are the most troublesome of animals to deal with. Many a horse has been burnt to death in a stable fire because even its bolting instinct was paralysed, and it was too panic-stricken to move or let its master lead it to safety. A dog under like circumstances would have walked straight out of the building, and cattle could have been removed without much trouble. It is well known that the only means of getting horses away in case of fire is to blindfold them, and even that is not always effective. But anything out of the ordinary upsets a horse, quickly reducing it to a state of unreasoning panic. A minor mishap, such as getting its foot caught, will inevitably cause a horse to kick out and plunge about wildly, running all the while grave risk of breaking a limb. Then take an even

smaller matter, how often has a horse left for a moment with the reins falling loose, stepped upon one of them, jerked itself in the mouth, and immediately given a bound that has broken the tackle. Never, under such circumstances, does the animal look to see what has happened. The minute it is in trouble it begins to plunge about, for it lives only for the instant, having a limited memory, and practically no ability to look ahead. With regard to the latter assertion, take the hunter that has done many seasons' work, and should know the game from A to Z. Accustomed to hunting, aware, one would think, that it will be very tired before its work is over and it returns to the stable, you would expect it to husband its energies; yet you seldom find a horse that "takes care of itself" when other horses are galloping by. It is on the dance, fidgeting and pulling, as eager to go forward as if there was no long day ahead of it. The excitement of the moment fills its limited intelligence; it has no thought for the future, only of the fleeting instant, which, from our point of view, is just as well.

Take next the puller as an example of equine mentality. Why should it bear with all its strength upon the bit? Apart from the fact that its mouth has been spoilt by bad handling, it is undoubtedly a matter of temperament, of that temperament that wants to go on, an unreasoning desire to gallop forward, so that the more the bit hurts, and therefore excites it, the more it fights to get away.

This brings us to the question whether a horse

enjoys racing, and if it knows that it is being raced to beat other horses. It is obvious that horses enjoy galloping in company, both in exercise gallops and on a racecourse, for they are fundamentally herd animals, and yielding to the impulse to go with the crowd must be highly exciting and pleasurable ; but that is a different thing from understanding the race as we see it.

I think it is exceedingly doubtful if any horse understands it is being galloped to win. To do so it would need the power to form concepts of the future which there is no evidence that it possesses. It may know, and in the case of an old hand undoubtedly does know, that a race is a very different thing to a gallop. What with colours up, the strange place and people, and last, but not least, the noisy crowd, it cannot fail to understand that this is something different from an ordinary gallop, and having experienced it before, will have a good idea what is coming. That, however, is another matter from saying to itself, as a human being would, " Now for a race, I must beat these horses, and get first past that post in front of the stands."

But occasionally when a horse has taken part in a strenuous finish, it may retain sufficient recollection of the result, of the punishment it received, to stop it going to the front, or doing its best, in any future race.

I knew a promising colt that was ruined for racing purposes by his jockey being unduly severe with him in a tight finish in his first race.

HARD LIVING AND SHARPER WITS

Shetland pony mare and foal photographed at North Roe, Shetland

Obviously in these cases the horse associates punishment with getting in front of his fellows, but this does not prove that the average thoroughbred, or any other horse, understands what it is being raced for.

Reverting to the question of whether horses enjoy racing, the behaviour of hunters that are run in point-to-point races gives us a clue, also showing us that they understand the difference between hunting and a gallop. The horse that has had one experience of racing invariably shows great excitement when it finds itself going out to race again; but that its comprehension of the race is limited is shown by its subsequent conduct in the hunting field. Point-to-point racing usually makes a horse "hot" and excitable. Each time another horse canters by, it snatches and pulls, evidently expecting to have to gallop on with it.

With regard to the racing question, it may possibly be asked whether the fact that some thoroughbreds run better on certain courses than others, does not indicate that horses really do comprehend what they are called upon to do, and if they have not preference for particular courses. My opinion is that when a horse runs well on a particular course it is a physical matter, not a psychological one. I mean that the horse finds the shape of the course or its gradients suit his conformation. A big striding horse cannot do himself justice on a cramped course, whereas a small nippy horse will find the bends just to his liking. A third horse cannot gallop downhill, but another will come

well down a slope. Thus the undoubted fact that there are horses for courses, does not necessarily mean that the horse remembers or has any preference for a particular course, but merely that he can go better on that one.

Reverting to the horse's memory, it is peculiarly limited in most respects. It is a commonplace fact that a mare forgets her foal, and stable companions forget each other, after a separation of only a few weeks. They meet as strangers, and with no sign of recognition. A dog remembers people for months, if not longer, and a wild creature like an otter has an excellent memory. On my return after an absence of over seven weeks, Moses jumped straight upon my knee and showed every sign of delight. But even better testimony to the memory of this species was the case of a pet otter that ran away, and returned after an interval of twelve months, greeted her old friends as familiarly as ever, only to leave the next day and disappear for good. What a contrast to the " out of sight, out of mind " attitude of the horse! The latter shows some affection towards those who feed and pet it so long as it is in daily contact with them, but there it ends.

As I have said, the horse is merely a creature of the moment, only concerned with the happenings of the moment, with little or no capacity for dealing with difficulties or thinking out situations. Moreover, it is a slave to habit, always doing what it has been accustomed to do, even when the circumstances have altered. The result is that when

anything unusual occurs it gets frightened, and loses what little wits it possesses. If it falls, or finds itself in a "tight corner," it will struggle madly to get up or get out—a dog under like circumstances would let its master help it out! I remember a horrible case of a horse jumping into barbed wire which well illustrates this, for when it found itself against the wire it plunged madly forward, literally cutting itself to ribbons, when by standing still no harm would have been done. It was so badly hurt that it had to be shot on the spot.

But, after all, it is the fact that horses are creatures of habit that makes them of such value to us, for their habitual memory is as good as their intelligent memory is poor. A habit once acquired is acquired for life. A horse's education consists of making it repeat at a certain signal conveyed to it by voice, touch, or rein, an action over and over again, until it associates the signal and the action, and its response to the signal becomes almost as automatic as that of a machine.

This is the essence of ordinary breaking and making, as it is of circus tricks, and of the performances of highly trained school horses, cavalry horses, and jumpers, whether at Olympia or over a country. The circus performer and the Grand National winner alike depend for their success on schooling. It is "school, school, school," all the time, incessant repetition either over fences or through the intricacies of the trick, until a habit is established and the performer does its work like a machine.

The intelligence of the average horse is certainly low. Look at the way horses will stand for hours by a gate waiting to come in to the stable, yet not one horse in a hundred ever attempts to open a gate, and the hundredth will be not a horse, but a pony! The difference in intelligence between horses and ponies is striking. The farther you get away from pony blood, i.e. from the unimproved blood, the bigger fools the animals become, while "as cunning as a pony" is proverbial. One pony I knew could open all ordinary gate fastenings, undoing them and pushing the gate open as quickly as any person, when he betook himself to the rick-yard or to "pastures new." When he saw anyone coming he trotted home to the paddock of his own accord, only to get out again so soon as your back was turned.

But a pony with so much intelligence as this is exceptional, which perhaps is as well from our point of view, for it is the unreasoning obedience of the horse which makes it such a perfect slave. Were it more intelligent, did it think more, it would not be so docile, nor so easily trained. We cannot expect a mentality of a high order in a creature that for thousands of years has been selected for every quality save mind. Here we have the clue to the greater brains of the pony. It lives, and has always lived, a more natural life, on the moors, hills, and islands, has never been much "improved," and in the hard struggle for existence has been subject to a certain amount of natural selection in which a meed of intelligence has been of survival value.

Much as I like and admire the horse, much as I owe to it, I cannot close my eyes to the fact that it is the least intelligent of our domestic animals, and without any ability to cope with the unusual. The "noble horse" undoubtedly owes its popular reputation to its association with man in sport and war, and to the haze of myth and legend that has grown up round its name.

CHAPTER XVIII

FLOCK AND HERD MOVEMENTS

THERE is hardly anything more impressive in Nature than the flock and herd movements of those social birds and mammals that gather together in immense numbers, when the concourse, often a large—nay, a vast—one appears to move as if animated by one mind.

This phenomenon is peculiarly impressive when a large flock of birds is wheeling and turning in mid-air. I know nothing more wonderful or beautiful than the evolutions of the lapwing flocks, that turn, twist, and swing with the precision of a regiment obeying the word of command, and with a rhythmic beauty that leaves one awe-struck. Especially do I remember watching such a flock giving an aerial performance against a background of sombre thunderclouds, when first the birds showed as dark specks, then as silver dots flashing against the gloom, for turning one and all together (such was the impression made on the observer) their white underparts showed up for the moment, only to vanish again.

What, moreover, could be more impressive than

the ordered evolutions of starlings, when a great flock rushes by overhead, with a mighty whistling of wings? The roar and rustling of countless feathers cleaving the air, the myriads of birds winging their way onwards without loss of place, undue hurry, or collision, without jostling or confusion, elbowing or strife, leaves the watcher with the feeling that here we must be seeing leadership, organization, and control.

Yet again, take the passing of a rook flock leaving the rookery or returning to it, flapping steadily on in a far-extending column, down which runs a steady ripple of cawing, but wherein all is orderly steady progress. What could be more impressive, what could be more suggestive of order and control?

No wonder it should be popularly supposed that "The many-wintered crow leads the clanging rookery home." No wonder that many persons ascribe all flock movements of birds, whether of starlings, waders gathered on the shore, lapwings or others, to organization and leadership. Nor is it strange to find another explanation sought, quite a different one, namely, that of a "mind wave," affecting all the component units at the same moment. This suggestion of a common impulse through thought transference, so that a vast flock may be regarded as having but one mind, is an attractive theory, and at first glance would seem to explain much that is strange in this wonderful phenomenon of simultaneous bird movement. But, as I shall endeavour to show presently a simpler explanation is possible.

As for leadership of the many by some sage individual, some elder ripe in the wisdom of many years, this undoubtedly does take place among certain mammals, though perhaps not in the definite form certain popular writers would have us to believe—birds, however, are another matter!

As a subject for the study of flock movements and social behaviour among birds the rook is excellent. Moreover, it is pre-eminently the bird that popular opinion credits with leaders and social organization, and which is believed to show remarkable sagacity in the conduct of its affairs. Hence I propose to make a careful analysis of its behaviour and movements as a help towards arriving at some understanding of the flock behaviour of social birds in general.

Not far from my home is a very large roosting rookery, to which many thousands of rooks wend their way in the evening and leave again early in the morning. That is during the summer, autumn, and winter months. In the spring the population is much reduced, as a number of the birds leave for the nesting rookeries; in fact, during the spring flock movements cease entirely. But they are resumed so soon as the outlying breeding birds bring their progeny home, when the jackdaws also come back. Jackdaws form quite a third of the population, as can be seen when a flock goes over. They are easily told, even when high overhead, by their smaller size, and quicker wing-beats. They flap their wings at least twice to the rooks' once. The total population of the rookery, rooks and jackdaws combined,

is hard to estimate, as it is composed of many flocks, which leave and return by different routes, but it must consist of many thousands of birds—fifty thousand is a very conservative estimate, and probably considerably under the mark.

One evening I watched the flocks return, coming in from north, south, east, and west as the sun was setting. The woods in which the rooks roost are on either bank of the Severn, and standing by the river I watched a strange display of bird behaviour, for instead of alighting in the trees on arrival, the rooks (the word "rooks" must be read as including jackdaws) turned and wheeled high overhead, the fresh arrivals swelling the wheeling throng, which swung to and fro, and round and round, against the sunset sky, like black specks upon a flame-coloured ground. More and more came in, the light waned, and suddenly the cawing throng descended.

What decided them to go down at that moment, and how did such a multitude act as one bird?

How difficult such questions are to answer, to attempt to answer at all. Before trying to do so it must be noted that to say they acted "as one bird" was not absolutely accurate, only approximately so. Their movement was not really simultaneous throughout the flock. A portion of the wheeling throng turned earthwards before the rest, though the others followed in so short a time that one seemed to see the impulse run through them like a wave spreading in water. Yet while the concourse was wheeling downwards and treewards, not all followed, for some birds were left behind,

flotsam and jetsam of the great flock which remained silhouetted as black specks against the sky. These individuals, perhaps of more independent mind and stronger will than their fellows, tarried a while ere sinking to rest.

Now I am quite aware that at the beginning of this chapter I wrote of flock movements being carried out "with the precision of a regiment obeying the word of command," for that is the impression such evolutions leave on the beholder, who is usually too amazed to make a close analysis of what passes before him. Yet invariably when one watches carefully one sees, as in the rook flock described above, that the movements and evolutions are far from being simultaneous throughout the throng.

Before going any further into this I must describe the conduct of the rook flocks as I have seen them when journeying to and from the rookery, when popular belief says they proceed under the guidance of some old and sage rook.

The first rooks, probably five or six birds, come flying over as soon as it is light, followed by other little parties, and then by bigger parties, one behind the other, all flying at about the same level, but in no regular formation. The breadth of the column varies, being sometimes no more than ten or twelve birds wide, at other times a hundred or two flying abreast. On some mornings they go out as a long thin line, a line extending from horizon to horizon, and taking from twenty minutes to half an hour to pass over; at other times they

travel in a broad and comparatively compact flock, taking only from five to ten minutes to go by. These remarks are equally applicable to the return journey in the evening. The rooks all fly at approximately the same height, but this varies according to the state of the weather. In fine, still, anticyclonic weather, provided the visibility is good, they fly very high, so high as to be mere specks against the sky. Stormy, gusty conditions bring them lower; and very heavy winds cause them to fly lower still, seeking the shelter of trees and eminences. It is a curious sight to see them battling against a westerly gale, winning their way through it, though often flung back by the gusts and tossed about like frail black leaves floating upon the wind.

Under these conditions the line is broken up into small struggling parties, and all semblance of concerted movements is lost. It is then obviously a case of each bird for himself, each one struggling along gamely as best it can.

Fog also upsets the rooks sadly, and, as described earlier, the flock becomes quite demoralized. About the usual time, i.e. soon after sunrise, one hears their voices, melancholy caws coming from the fog, and small parties appear and disappear, like wraiths in the mist, but some are going this way, and some that, and some are *flying in circles*. I have repeatedly seen rooks *hopelessly lost in fog*. The birds appear helpless when their landmarks are obliterated, and are no better able to find their way under these conditions than we are.

Of course the question of getting lost in a fog

has no bearing on the matter of leadership, for no leader, however expert, could help his followers under these circumstances; but it undoubtedly gives us a valuable sidelight on thought transference through the flock. Surely if there is anything of this nature, if mind-waves do occur in flocks of birds, they should be able to operate independently of sight, and whether the units in the flock can see each other or not. No one watching rooks appearing and disappearing in a fog could doubt that they are lost in every sense of the word, their frantic caws testifying to the eagerness with which they seek their fellows. Moreover, in a fog they appear quite devoid of any sense of direction, which goes to show their direction-finding is done by sight alone. This point has been dealt with in the chapters on "Homing Instinct" and "Migration"; what it is wished to emphasize here is that a rook flock in a fog shows no evidence of finding its way by any sense or means other than those we are acquainted with and use ourselves, namely, sight and hearing.

Now to return to the long column winging its way over on a fair morning, when its formation is not interfered with by adverse weather. I have mentioned that the first comers are small parties which may be described as the vanguard of the column proper. This follows, but watching it closely one's first impression of steady orderly flight is modified; the ranks are here thick, there thin, the birds seem to be in parties of varying size, and to pick out any particular birds as leaders of these

sections is impossible, since the stragglers from one section appear as the leaders of the next. Moreover, birds are continually hurrying up the column or falling back, and now and again a few fall out; for instance, seven jackdaws suddenly detach themselves from the flock and drop down to a huge elm (are they the family that left a nest in its hollow trunk a month or two previously?), where they tarry for a while. Only one or two stragglers are left in sight when they rise and fly after the flock.

Close observation day after day makes one realize that the first impression of orderliness must be modified, and the more one watches, the less evidence one can see of leadership or organization. The conviction is irresistibly borne upon one that there is no such thing in the rook flock.

My opinion, after much watching, is that the chief factor governing a rook flock is the impulse to follow. This impulse, probably a true instinct (i.e. an unconscious response to stimuli received from without), is one of the most widespread sources of action to be found in the animal kingdom, and is the source of most flock, herd, and crowd movements, as I hope presently to show. This fundamental impulse is, of course, greatly modified by intelligence and experience, but it is always present, *even in ourselves*. My interpretation of the behaviour of the large mixed flock of rooks and jackdaws that has been described is as follows: The break of day finds the birds waking and preening; some, that fed well overnight, hardly yet alert, but others, who

did not have so good a supper, already on the move and eager to be off. These keen and hungry birds take wing, and with the image of some good feeding ground before their mind, make off, cawing as they go. This example rouses others, who follow them, and these in turn disturb their neighbours; larger and larger parties take wing, and the greater the number that leave, the stronger the desire of the rest not to be left behind.

We may doubt if the rank and file have any conscious wish to go to any particular spot; it is probable they follow on without thinking about it, accentuated solely by the desire not to be left behind, and the impulse to follow those ahead.

In this sense there *is* leadership, but it is unconscious leadership, not the ordered organization of a regiment, but the undisciplined flow of a crowd. We cannot find anything to show the birds are following a deliberately chosen leader.

Nor is there anything in their behaviour which when analysed cannot be understood, which needs any special explanation, such as the theory of thought transference and mind-waves.

At this point I can imagine a reader saying, "Why rule the latter out, when you can't prove it does not take place, when birds may have some unknown sense, and be more sensitive to such influences than we are?" To which I would reply, Such may indeed be the case; but in approaching the problems of Nature, especially those of animal behaviour, it is not helpful to a true understanding of them to employ a hypothesis based on imagination and

guesswork, especially when the facts fit into a simple theory employing no unknown factors.

To return to the rook flock, we will now consider its behaviour when it arrives at the feeding grounds, or rather we should say, the actions of one of its sections, for detachments separate themselves from the big flock and go off to seek for food. I have never seen anything approaching the number of birds that leave the rookery together, feeding in each other's company, but I have seen the minor flocks reassembling for the journey home. The average size of the feeding flocks I have watched may be put at a thousand birds (though smaller detachments are common), which is a quite sufficient number when they alight on a field of newly sown wheat. They invariably descend upon the neighbouring trees, wheeling round and dropping upon them by twos and threes and fives and sixes. After a little delay on these vantage points some of the rooks descend to the ground, to stalk about and conduct a busy search for insects, grubs, grain, etc. The majority soon follow, but two or three may tarry, though these will follow eventually. After a while a bird or two may return to the trees, but so far as one can see, such returns are haphazard. It appears to be pure chance if any rooks remain in the trees after their fellows have descended, and equally a matter of chance if any birds fly up when these come down. They are more likely not to! Careful observation shows nothing in their behaviour to suggest the intentional placing of sentinels, nor the purposed relief of watching birds. Such rooks

as are left in the trees are mere stragglers from the flock.

Yet the birds, both rooks and jackdaws, but especially the rooks, are keenly alert, as those who attempt to approach them find out. One or more of the flock soon catches a glimpse of the would-be observer, and with a sharp caw springs into the air. The rest follow so quickly that it needs close attention to perceive that their response was not really instantaneous, and that they really act an appreciable fraction of time behind the bird, or birds, that saw the danger. By watching the behaviour of a flock when alarmed, one realizes that far from acting as if animated by one mind, there is that short but significant pause between the first alarm and the flock taking wing which tells that each individual has to see, hear, and take in the alarm signals. Their response is quick, very quick indeed, but it varies in different birds, and some are seconds longer than their fellows in getting upon the wing.

Surely if communal impulses were a fact the flock would literally rise as one bird ?

Moreover, as they wheel and turn in the air, apparently striving to see what grounds there are for the alarm, close watching again shows that they do *not* do the same thing at the same instant. Most of the birds seem to be accentuated by a desire to do like their neighbours, but some wheel away, and do not even follow the flock.

At this point I can imagine the reader saying, " Granted that the interpretation of the rooks'

behaviour is correct, and that the rook flock is just a collection of individuals ; what about other flocks and herds ? Are we to deny leadership, are we to deny ' mind-waves,' to the starling flock, the flock of sheep, the herd of deer, etc. ? "

As a very large gathering of starlings is a peculiarly impressive sight, and as the starling flock is *par excellence* that from which we might expect to glean evidence of a communal mind, I will give some notes dealing with this bird before attempting to reply to these queries. I recently had the opportunity of watching immense numbers of starlings, when going to their roosting-place, and the following are the notes I made :—

" It was about 5.45 on March 23rd (about half an hour before sunset) when we reached the place, at which time not a sign of a starling was to be seen, but by the time we had had a look round the ' whitewashed ' covert a solitary starling went hurriedly over on whistling wings. A few moments later a party of five flew by, and when I reached the spot where we were going to keep watch a flock of a hundred and fifty, or thereabouts, came over. These all disappeared over the valley, and we could not see what became of them. Now small parties, from twos and threes to fives and sixes and upwards, became numerous, and kept passing over. We lost sight of most of them down the valley (they were coming in from *all* directions), but thought they had not gone far and were merely flying round. Then, out of the heavy grey sky to the east, a much larger flock, quite a thousand to

fifteen hundred birds, made its appearance, flying in a far-extending line. As the birds got near, this line contracted ; it became a compact flock, which as the starlings neared their destination, rose high in the sky. Coming in from the other side, so as to meet these birds, was another and similar flock. The two companies met, rushed by each other, whirling by like leaves blown before differing gusts of wind, swirled round an invisible vortex, mounted higher and coalesced. Flying together, they passed over the wood, and as the light was now fading we lost sight of them. Other flocks were coming in, much bigger flocks than at the beginning. Down the darkening valley came one of many thousands, rushing along with a murmur of wings like the wind blowing through leafy trees in a summer gale, the birds silhouetted as tiny black specks against the palid sunset sky that gleamed between the storm-clouds. Spots of rain splashed on my face as I watched them go by. A huge concourse was now swinging to and fro on the south side of the wood, wheeling and whirling in slow strange evolutions like smoke blown about by the wind. Watching the smaller flocks, one was impressed by the individuality of the component birds ; you saw ones and twos separate and go their own way, rejoin the party and leave it again. Even the moderately big flocks showed plenty of independence in their units ; their behaviour was obviously individual, and the flock movements by no means unanimous. Many birds lagged behind, as they swung and turned, or flung themselves far beyond the flock ; but when

one came to watch the largest flock one was so dazed by its size and numbers that the effect of individuality was lost. One seemed to be watching a single thing, a vaporous being, a cloud, a long dark sinuous cloud, that spread and lengthened, gathered itself together, contracted, burst asunder, coalesced again, and swung and twisted to and fro. This enormous gathering was now absorbing all the incoming birds. A party would arrive, winging their way in the usual starling hurry across the darkening face of the country, and swing over the wood, drive past the mighty gathering, one stream going one way and the other the other, turn towards it and vanish into its midst. The great concourse continued to wait in mid-air, all the time whirling in aerie evolutions, sometimes drifting a quarter of a mile down the wind, and anon coming back up it. How many birds were in the gathering it was impossible to say ; estimate was hopeless, and eyes and brain reeled before the attempt at computation. They were like sands upon the seashore—innumerable. Yet every speck in their long dark cloud was a bird, a life, an intelligence ! And still, in the fast-gathering gloom the starlings swung overhead, sometimes coming closer, with a murmur as of the sea, sometimes drifting away. Even then their numbers were being added to. It was quite the ' edge of night ' when there was a great rush of wings and yet another immense flock came in. It went by and under the main gathering, showed densely against the sky as the birds all turned together, rose and was drawn

into the assembly. Now, how many were there? Well, if a guess must be made, not *less* than a million, perhaps twice that number!

"Whereas to begin with the starlings had swung to and fro over the countryside, the fast-approaching night found them making the wood the centre of their evolutions. At every turn they got nearer and lower, swooping down with a mighty rush of wings towards the trees, only to swing upwards again, but not so high as they had been before. Yet it seemed as if they would never actually settle. We now could hardly see them against the trees, and then only dimly. At last there was a roar, a rushing roar, as of waves crashing on a rocky shore, and we knew part of the flock had alighted; but up into the air went the dark cloud that represented the greater part of the starlings. It swung round, darkened, and grew dense in the middle, which dark part bulged downwards, like a rain-cloud about to burst as a waterspout, and dropped upon the wood. Another roar smote our ears, and we knew many thousands of starlings had alighted, but the mighty flock, hardly yet diminished, swung up again. Up and down, round and round, and down and up it went again and again. Would the starlings never get down?

"We grew chill as we waited and watched; not that we could see much now, but the crash of descending thousands became more and more frequent, the roar of their wings and the swaying of boughs echoing through the night. Once the birds dropping from the flock checked their course,

turned back, and met the others above them. The sky was black with a confusion of birds. Did any collide? The light was too poor to see, but how they could avoid doing so I cannot imagine.

"Up they all went once more, then down again, another great rush and roar, and this time all had descended.

"Such was the behaviour of the starling flock on a windy, rather stormy evening, but I also watched them on a calm evening when they behaved differently.

"It was a still afternoon, the weather being of an easterly type, and the sun was sinking like a ball of crimson to the north-west. While we were yet a mile from the starlings' wood, a small party of the birds went over, and a little farther on we saw a large flock upon some trees, and in a meadow. We pulled up the car to watch them. One tree, an ash, was literally black with birds, its boughs so weighed down we expected them to break. These starlings, alarmed at the approaching car, took wing, when the branches of the ash sprang up many feet in the air. But the birds were not really frightened at the motor; they simply wheeled round, some returning to the tree and the rest descending into the field. Looking over the fence into the meadow, we saw an astounding sight—the field was a mass of starlings. A huge flock covered the grass, which the birds were searching busily, starling fashion, parting the blades by thrusting their beaks into the grass and then opening their mandibles, after which they peered between for

hidden treasures. Every bird was at work, and all seemed to be chirping and twittering at the same time, so that there was a loud murmur of bird voices upon the evening air.

"How many were there? Estimating the space they covered at 100 yards by 70 yards, and putting four starlings to the square foot (they were shoulder to shoulder in most places, and were more probably seven or eight to the square foot!), we have thirty-six to the square yard, or $36 \times 100 \times 70 = 252{,}000$. I think their numbers were decidedly above this.

"The flock was in motion all the while. Each individual was hunting and running forward in the most busy manner possible; beside which, starlings, apparently dissatisfied with their position, kept flying forward, over the heads of their fellows, to reach fresh turf which had not been searched. The birds at the rear of the flock were thus continually moving over to the van. There were also side-by-side movements, parties shifting from right to left of the body, or vice versa. In every instance these movements were started by one or two birds, the others following in a stream. I did not see any really simultaneous movements. Even when a portion of the flock, some thousands in number, took wing, and went up into the fence and trees, it was done in the same manner: a few rose and others followed them, more in turn following these.

"A few minutes later the whole flock rose, having, I think, been alarmed by us; but though it only took a few moments for this large flock to take wing, even this was, comparatively speaking, a

gradual movement. I saw a few birds jump up into the air, after which the alarm passed through the crowd in less time than it takes to tell, yet most certainly *not instantaneously*. With a roar of wings, they were up and off, flying in the direction of their roosting-place straight and fast as starlings do.

"We followed on, the sun's fiery ball being now in the act of dipping behind a purple hill, and as we reached the roosting-place many parties of starlings were passing overhead. We decided to divide, one of us watching the starlings from an eminence a little way from the wood, the other going down to the covert. I had the latter post, taking my stand close to the thick thorn-bushes and the young larches in which the birds always roosted. The trees were 'whitewashed' and the place smelt like a bird-cage. In a few moments there was a noise like that made by the engine of a car, but it was only an unseen flock going over. My fellow-watcher afterwards told me that this and several other immense flocks had alighted on the nearby meadows, which were literally blackened by them. Every time any part of the gathering took wing the same roar was heard. Of course I could not see this crowd, but after a few minutes' waiting starlings began to pass over my head like a river of birds. These swung round over the larches, revolved once, and shot down like a cataract into the thorn-bushes outside the covert. In a moment the bushes were black. A dull roar, and another division poured in, to be followed in a second by a third flock.

These two did not actually alight at the first descent, but met each other above the bushes, so that for a few moments the air was full of birds, when with a yet greater crash of wings they all dropped earthwards. Trees and bushes sagged under the burden. More starlings came, and those that had already got down shifted their positions, a rush of wings being heard each time they moved. Every movement carried them nearer to the larch-trees. The birds were 'talking' all the time, starling voices making an incessant din of chirping. More came, and yet more, until trees and bushes were seething with birds. They were packed in black masses that showed up against the last faint glimmer of the sunset.

"It was now practically dark, so I walked close to the covert fence and clapped my hands; once, twice, thrice did I do so, but it had no great effect! The nearer birds rose with a mighty rush in the darkness, but it was only to alight a little farther inside the wood. The bulk of the multitude were not disturbed, and there was no panic—the alarm did not run through the flock, and the birds out of sight and sound were not upset. This appears to me strong evidence against the 'communal mind' theory, for surely a 'thought-wave' should operate as well in the dark as by day, and the alarm should spread instantly through the flock irrespective of whether they heard or saw the cause of it."

The above notes were written immediately after seeing the starlings, and while the scenes were fresh

in my mind. Two salient things stand out from them—the repeatedly noted independence of the units of the flocks, combined with that strong impulse to do as your neighbour does; and the dazzling effect of watching a great assembly on the human mind. When one reads of unanimous movements of flocks and herds, one must make allowance for this latter effect. It is difficult to keep close and analytic watch on a really vast gathering, and it is only by a considerable effort that you can concentrate on the units rather than watching them as a whole. Hence in some respects it is better to watch smaller flocks, for one can follow the doings of the individuals with more ease.

Though solitary in the breeding season, the wood-pigeon is a social bird at other seasons, and its flocks often afford good material for crowd studies. The following notes were made on a medium-sized flock to which the above-mentioned drawbacks of the great assembly did not apply.

"*March 9th.* A wood-pigeon flock, presumably migrants, alarmed and swinging round in the air, hesitating whether to return to the trees they have just left. The whole flock comes round in the air with a swirling motion, the outer birds losing ground (or rather 'losing air!'), compared with the inner ones, by reason of their position, for all are flying at about the same speed. The birds that form the pivot of the flock begin to drop into the trees while the far-flung outer birds are yet turning. These latter are many minutes behind the others in taking perch. Numbers of pigeons detach them-

selves into minor flocks and go off in other directions, to take perch on distant trees. Soon all have alighted, dropping down by ones and twos in a leisured independent manner. Their movements are certainly not simultaneous. There is a good deal of ' following my neighbour,' and also of ' do as I like ' about these pigeons."

* * * * *

From these detailed observations we see that the bird flock is not one, but a conglomeration of independent units, the welding of the units into a whole being due to the innate impulse, which even we possess, the desire to do as your neighbour does, to follow where others go ; and it is to this fundamental impulse we should look for the explanation of flock and herd movements, for the explanation of flock evolutions, rather than to any mysterious and unknown means of communication.

CHAPTER XIX

COURTSHIP AND MATING

IN the higher animals courtship is often a long and complicated rite, in the birds especially being accompanied by exquisite displays on the part of the male, who in many cases is decked with wonderful adornments (plumage, wattles, etc.), the sole purpose of which seems to be that of exciting and pleasing the female. The classic example is, of course, the peacock, whose marvellously adorned train, gleaming with hundreds of eyes, is spread fanwise, and held erect by the plain grey tail feathers and the strong muscles of the back. With this wonderful fan standing like a huge halo around him, the bird struts with drooping wings before the hens, as if asking them to gaze and admire this glorious beauty ; but they take little notice of him, often going on feeding in seeming indifference, until the cock, swept by a gust of passion, sets his train vibrating, so that the gleaming feathers rattle and quiver. Sometimes this attracts the attention of the hens, sometimes it does not. It is obvious that they take comparatively little interest in the doings of their lord and master. The old theory of sexual

selection, put forward by Charles Darwin, namely, that the magnificent coloration and adornments of many male birds, and the antlers and other appendages of many male mammals, are the result of the conscious choice by the females of the handsomest of their wooers, has found little evidence to support it of recent years, the field naturalist being unable to bring forward any cases of deliberate selection on the part of the ladies.

The function of gorgeous plumes in the male bird seems rather to be that of exciting and rousing the females, so that they will respond to the attentions of their suitors; conscious selection does not appear to enter into the matter at all. Indeed, courtship in most species of birds seems apart from consciousness and deliberation, but to be rather a performance of an age-old instinctive rite. The ripening of the sexual organs sets the train of actions in motion, which lead the bird on through sequences of behaviour, thrilled by evergrowing excitement, to the actual pairing.

Volumes could be filled with accounts of the courtship of different species of birds; from displays like those of the peacock, and other polygamous birds, before their many females, to the equally marvellous exhibitions of the even more magnificent birds of paradise before their solitary mate; and again to the wooing of a single female by several males, as in the polyandrous species, such as the red-necked phalarope.

In this latter case the female, a dainty fragile snipelike little bird, is larger and more robust than

the even smaller and more fragile male, being also more handsomely adorned, and in every respect the stronger sex. She carries her emancipation to the lengths of encouraging many suitors, and it would seem to be accepting attentions from them all, though one of them is favoured more than the others, for when she has laid her clutch of four eggs in a depression of some dry tussock of grass that rises above the marsh on which the phalaropes live, she turns the duties of incubation over to him, and goes off, leaving him to sit on the eggs.

But it is not so much these exceptional cases that are of interest to us as the courtship and mating behaviour of the ordinary birds and beasts around, and then with special reference to the question, What is their state of mind towards it ?

The actual passionate fervour of love-making, and the peculiar attitudes and displays accompanying it, are unquestionably largely instinctive, in the sense that the bird performs them without stopping to think. The bird is undoubtedly in such a state of emotional ecstasy that it postures and displays without any clear notion of what it does. Take the familiar English robin as an example. The cock, when trying to win a mate, droops his wings and puts up his tail in a most amusing attitude, and thus struts before the hen. The common blackbird lowers its head, depresses and spreads its tail, and grovels before the lady ; and it is obvious that both are so excited that they are oblivious to all but their would-be mate before them.

Yet the love-making is not always done solely

by the male, especially in the ducks, among which the flirtatious behaviour of the females in the early spring is most amusing to watch. The common mallard associates in flocks during the winter, but in the early spring the companies break up, previous to which there is much excitement over the pairing. Later I shall show that the association of a given duck and a given drake extends far beyond one season, but at the moment am only concerned with the general flirtatiousness of the company and the pairing off of the young unmated birds. The advent of spring is marked by quacking and excitement, when the ducks and drakes assemble on the water, and there is much bowing, ducking of heads at one another, and incessant conversation. A drake will bow to the company, at the same time elevating the hind part of his body, and then, quacking softly in his husky voice, draws himself up; at which two or three ducks swim round him in circles, their necks extended level with the water, at the same time quacking loudly as if trying to drive one another off. This performance leads up to the pairing of the ducks and the drakes, when the mated couples go off together to find a secluded spot for nesting. Each drake takes away his wife, or wives (he may have two), for where there are many together the ducks are much persecuted by other drakes—the mallard's morals are none too good.

In some species, as we have seen in the chapter on "Territory," the possession of a desirable estate is an important step towards obtaining a mate, a

cock without a home being in an almost hopeless position. This applies chiefly to the warblers and other song-birds, for in the case of the crows, birds of prey, etc., I believe the mated pairs go house- or rather estate-hunting together.

Before going on to speak of courtship among the mammals I must revert for a moment to courtship displays among birds. It is an invariable rule that such displays show off the especial beauties and best points of the cock. This was particularly impressed on me one day when watching some grey wagtails, four in number, insect-hunting beside a woodland stream. They kept running about, backwards and forwards, in and out of the water, looking perfectly exquisite in their grey plumage, set off by their lemon-yellow breasts. There was only one cock, distinguished by his black gorget, which much enhanced his appearance.

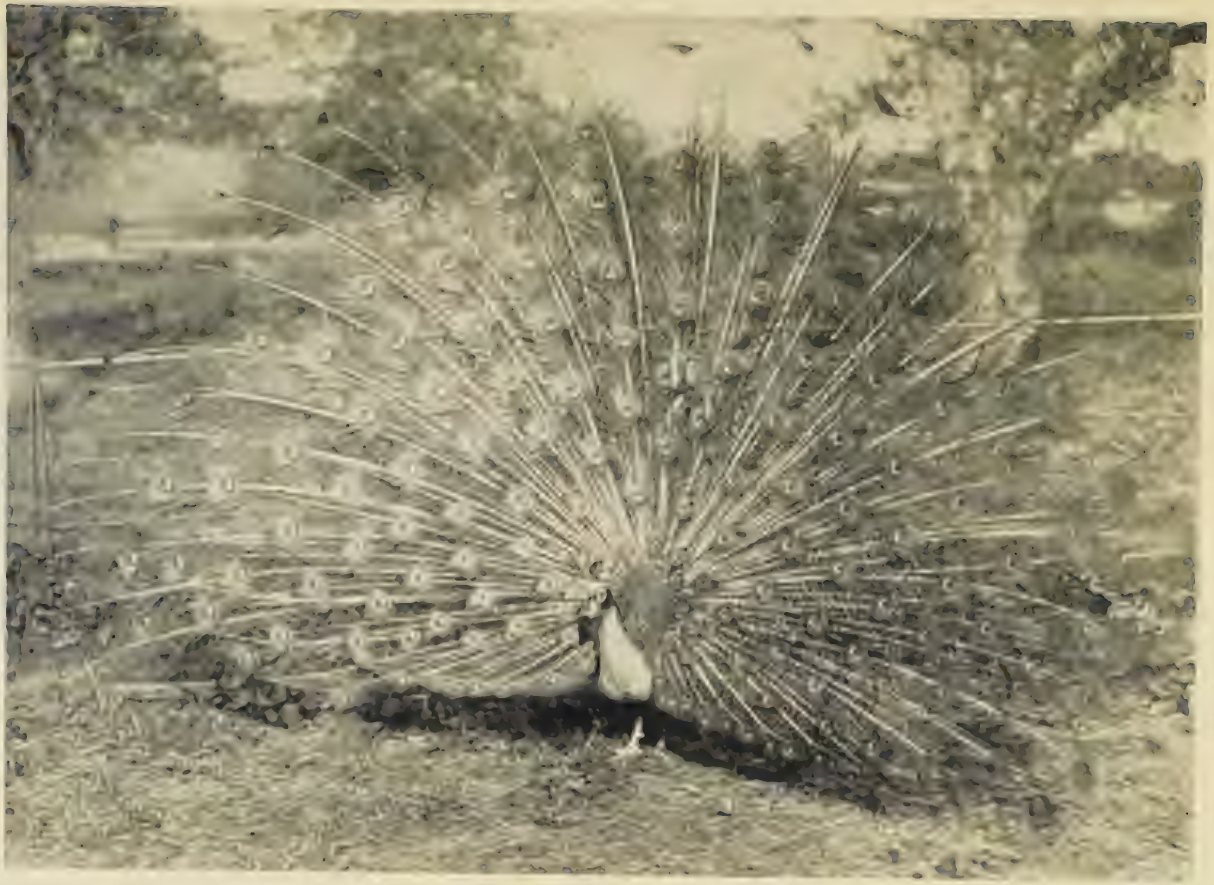
Presently one of the hens left the water and went out on to the sandy bank, where she lay down, fluffed out her feathers, and proceeded to sun herself, evidently enjoying the warmth that poured down upon her. The cock now left the stream, and after him came another hen. He went towards the one that was sunning herself, stopped when about a foot away, and displayed before her. He raised his head in the air, pointing his beak skywards, so that the full extent of his black cravat could be seen and admired; he spread out his tail fanwise, dropped his wings, and fluffed out his beautiful yellow front.

The pose was admirably suited to show off the

beauties of his dainty person, but as the birds are not in the habit of studying themselves in looking-glasses or of practising which pose suits their looks best, we are forced back on our original conclusion that the display attitudes of birds are not consciously purposeful, but are part of the hereditary instinctive sequence of actions that form part of the courtship rites, and which have been handed down through unnumbered generations.

But intelligence is present at the same time, altering and modifying the behaviour. When this cock had posed thus before the hen for a couple of seconds, a second hen came up behind him, which bird seemed more interested in his proceedings than the hen before whom he was displaying. Number 2 had come up unseen by the male wagtail, and now uttered a low note, at the sound of which behind him, the cock dropped his attitude and began to hunt for insects in a hurried and abashed manner. It looked exactly as if he had been caught by his mate flirting with another hen. The way he hurried off has remained indelibly fixed in my mind as one of the funniest things I have seen when watching wild life.

The courtship of mammals is never so spectacular as that of birds, though the combats of rival males are dramatic enough. In most species there is a certain show of reluctance on the part of the female, in many cases culminating in flight, of a sort, and capture by the male, but such behaviour seems really calculated to enhance the ardour of the would-be mate.



THE PEACOCK'S GORGEOUS DISPLAY

In many cases, unlike the birds which in the majority of instances mate for the breeding season, if not longer, the association of the sexes ceases after the act of pairing. Most male rodents are without the least interest in their offspring. The buck rabbit is certainly without any interest, unless it should be to destroy them! The doe hare goes her way independently of the jack, and the buck rat shows no sign of shouldering parental responsibilities. Then, to turn to deer, the stag does not worry about the fawns, or show any interest in them; and similar instances could be multiplied indefinitely—that is, so long as one confines oneself to the rodents and ruminants; but turn to the carnivores, the hunters, and the case is very different.

In "The Mind of the Hunter" (Chapter XVI) I have described the predatory beasts and birds as being of a far higher mentality than the small-brained, more or less instinct-controlled, herbivorous creatures. The hare, for instance, is a terrible fool, entirely at the mercy of passing impulse, and with a very poor memory. Take the fox for a contrast: it is cautious, purposeful, and a faithful mate. Proof of the high degree of mental development among the carnivores is to be found in their domestic arrangements. In many species pairing is pairing in more than the passing sense of the word, and once mated they are wedded until circumstances force them apart.

The North American silver fox has afforded an illustration of this. The devoted attachment of the

dog fox for the vixen was little suspected until the value of the pelts led to fur-farming. Then it was found that promiscuous breeding was impossible. Couples casually put together would have nothing to do with each other, and success was only achieved by carefully introducing a dog and vixen to each other, then letting them live together, and never parting them. It might have been thought possible to have one dog fox to several vixens, but practice has taught the farmers that the wedded couples are faithful to each other, and it is impossible to arrange anything of the sort. It is this that makes guaranteed breeding pairs so valuable.

Long observation of the habits of the English red fox (which is closely allied to the North American red fox, the silver fox being a melanic variety of the latter) has given me the highest respect for its morals and character. Like the American fox, it is certainly monogamous, the dog fox being a devoted mate and exemplary father. When there is snow upon the ground you have a good opportunity of studying the behaviour of the foxes, and seeing how the wedded couples go about together. I have trailed them thus for miles, noting how inseparable they are, and that wherever the one goes the other follows. They rarely separate for more than a few yards, and across the open the trail looks like that of a single fox, the one having followed hard upon the heels of the other, so that the footprints of the hinder fox are superimposed on those of the fox that was leading. In the woods and among the bushes the two trails may part a little, but they

do not go far apart, only a few yards at the most, and soon rejoin when there is no hunting to be done.

Even after the cubs are born the dog fox remains near his mate, and when they begin to require solid food he assists her in providing for the family, carrying home rabbits and other game. My opinion —but of course it is almost impossible to prove it— is that, like the silver fox, the English red fox mates for life, until death dissolves the tie.

Now if there is one creature more notorious than another for its amours, it is our domestic cat, so it will seem somewhat extraordinary to turn to the wild cat (*Felis silvestris*) for our next example of martial constancy, yet there is some evidence of lifelong attachment between the sexes. There was an old male at the Zoological Gardens, Regent's Park, London, who had been captured with his mate, but she did not survive long in captivity, and he was left an apparently inconsolable widower. He refused all food, and appeared likely to follow his mate to an early grave. " His keeper, however, put his own cat, a tortoiseshell and white Persian, into his cage ; the widower recovered his spirits, and together they lived to a ripe old age, rearing at least one litter of kittens every year. All attempts to divert his attention to other females failed, and a Persian female of mine spent more than a year with him, but he took absolutely no notice of her." (Sir Claud Alexander on the " British Wild Cat," in the *Year Book of the Amateur Menagerie Club* for 1912.)

The contrast between the behaviour of this *Felis*

silvestris tom and the love affairs of a domestic tom is startling, to say the least, as it must not be forgotten that domestication has a marked effect on the character, mental disposition, and morals of animals, an effect, in my opinion, of a degenerate description.

Turning to the birds of prey, such as owls, hawks, falcons, and eagles, creatures which exceed the rest of the bird world in intelligence, as much as the predatory beasts exceed the non-predatory, we find constancy between wedded couples the rule rather than the exception ; and by " constancy " I do not mean that they are faithful to each other for one breeding season, but for life. In the long-lived eagles this is especially marked, certain pairs frequenting certain areas for long periods, until death claims one of them, when the survivor may re-mate if there is an unattached bird in the vicinity, but is more likely to remain solitary. The male white-tailed sea-eagle of the West Cliffs, North Roe, Shetland, on losing his mate went away and found another female, bringing her home to the old eyrie, but when the latter was left alone she made no attempt to procure a fresh husband, and remained an unconsoled widow for many years. Then there was the golden eagle of Skomer Island emphasizing the same thing. There he lived for many years, quite alone after his mate was shot, yet a day's flying northwards would have taken him to districts where others of his kind could be met with.

In the case of the smaller birds of prey, which are less notable and conspicuous, the evidence is

largely inferential, but when one sees them in pairs after the breeding season has gone by it is a reasonable presumption that the wedded couples keep together. When one sees a pair of buzzards soaring round and round together in December, over the crag where a pair had their nest the previous June, it is reasonable to suppose them the same couple, still in each other's company, and intending to remain together.

When writing of the courtship of the mallard I mentioned this species as one that afforded an instance of lifelong attachment, the case I had in mind being that in which a drake of the variety known as the call or decoy duck mated with a large brown domestic duck of the ordinary farmyard breed. She was a very large duck, and he was a typical mallard drake, being only about half as big as his mate. It was a most amusing sight to see them going about together, which they did year in and year out, until the old duck died. Though so attached, his attachment did not prevent the drake pursuing the ducks belonging to the other drakes, but such lapses do not seem to count with the wild duck ; the big duck was his mate—he drove the other drakes away from her, went everywhere with her, and, as nesting-time approached, helped her in the search for a good nesting site, standing by quacking as she poked about in the bushes trying to find one.

This case shows that even in the duck we may have lifelong devotion, an attachment extending over years, and one which we might term an

intelligent devotion, being independent of the yearly mating fervour.

Reverting to the beginning of this chapter, we have seen that courtship and mating, especially among the birds, are parts of the long and complicated rites leading to reproduction, and the rearing of the young; that they are initiated by organic changes and follow in an orderly sequence that is as much part of the hereditary make up of the species as its size, colour, and shape. These actions, often exceedingly elaborate and complicated ones, are unquestionably instinctive, and are performed without thought. The cock bird displaying before his hen is swept by an emotional storm, in which he postures and shows off because such action "comes naturally." There is nothing to show that the peacock, strutting with train erect, is saying to himself, "Is not this a beautiful fan!" It is much more likely that he is only conscious of the hens before him, and an intense pleasurable excitement, an excitement that thrills him, until, in a gust of passion, every feather shakes and quivers with emotion.

Apparently the biological purpose of it all is to arouse a similar excitement in the hen, and induce her to accept the cock's advances.

Yet, though we have seen that courtship and mating in the birds, and likewise in the mammals, is so instinct-governed that conscious control has little to say in the majority of cases, the "man at the wheel" is not always a passenger. In many mammals, and in the birds of prey, also in some

other species of birds, he is not only there, but his guidance is obvious. When we find birds and mammals mating for life we may safely infer that here is more than blind instinctive emotional reaction. And when we find the survivor of a pair remaining solitary in the old locality, we shall be hard put to describe the case in terms of stimulus and instinctive response.

CHAPTER XX

THE SOCIAL ANIMAL

THAT some creatures are more sociable than others is a commonplace fact known to us all; that some delight in the company of their fellows, while some prefer a more or less solitary existence, is so obvious that we are apt to overlook its significance; yet, when we consider for a moment, we perceive that the mentality of those that delight in a social life cannot be the same as that of the ones which prefer seclusion. The heron, that fishes by itself, must have a different outlook on life to the rook, which loves to associate with hundreds of its fellows, and usually goes out to feed as one of a great flock.

Before proceeding to speak of the mind and intelligence of the social bird or mammal, it will be well to consider the behaviour of a few creatures that gather in flocks and herds, for it is only through the study of behaviour that any clue to mental states can be obtained.

As in this country—England—where most of my natural-history work has been done, there are practically no wild social mammals (the red deer is

our only really wild one), I shall devote most of my remarks to birds, of which we have many social species, from the familiar rook, the starling, lapwing, etc., to birds such as the puffin and guillemot.

In this sentence, however, have been included birds which, though they assemble together in great numbers, choose diametrically opposite times of the year for doing so and, it may be assumed, are exhibiting different phenomenon.

The rook, starling, lapwing, and many waders, gather in flocks as soon as the breeding season is over, and remain in company during the winter months.

The sea birds, such as the puffin, guillemot, razorbill and kittiwake, assemble for breeding purposes, and scatter when once their young can fly, the enormous flocks of the spring-time then breaking up into small parties.

We will consider the winter flocking birds first, taking our homely rook to begin with, as it certainly is the most familiar example. As soon as the nesting season is over, and the young rooks are strong on the wing, the parties from the different small rookeries about the countryside abandon the spots where they were reared and resort to the principal rookery, the great roosting rookery, where thousands of their fellows assemble each evening. This large rookery will form the headquarters of the rook population of a large area. The one I have in my mind as I write, and which I have already described in this book, has no rival roosting place, either big or little, for twenty miles around.

It has a fairly large number of permanently resident rooks, which breed there, but the majority of its birds go off in the spring-time to outlying nesting places ; whence they return in the summer, bringing their families in their wake, so that early autumn finds the rookery occupied by a very large population.

Having already described the behaviour of these birds when going to and from their feeding grounds, also their behaviour when searching the fields for food, it only remains to point out that the assembly is literally a gathering of the clans, the flock being built up of family units, which applies also to the jackdaws that accompany them, and in whose case the fact is usually more easily discerned. Watching a feeding rook flock, one will note a surprising number of jackdaws among the bigger birds, and observing them for a while you see that the jackdaws are swaggering about in threes and fours, little parties and groups in the great gathering.

The fieldfare of Scandinavia is an even better example of immense winter flocks built up by the amalgamation of smaller units. This species is a sociable one all the year round, though not to such a marked extent during the breeding season as the rook. It breeds in small colonies of five or six nests. One finds half a dozen nests in a group of birches or firs on the side of a Norwegian valley—the owners shrieking at the intruder in the most noisy manner—and then will see no more for a quarter of a mile or so.

I hazard a guess—it is no more than a guess—that these groups are family groups, i.e. belong to related birds, but only the marking of young fieldfares could put such a supposition to the test. However that may be, it remains a fact that the fieldfare is a bird that takes pleasure in the company of neighbours during all phases of its existence, unlike its near relative the redwing. The latter species, as we all know, assembles in large flocks, often immense ones, from autumn onwards, and comes across the North Sea from its breeding grounds in Scandinavia in great numbers. Yet during the breeding season, when at home in a Norwegian or Swedish valley, it is as shy and retiring in its habits, as solitary and unobtrusive, as it was formerly bold and conspicuous. Unlike its relative the fieldfare, each pair nests in solitude, making a thrush-like nest in the depths of some bush. Presumably the redwing is exhibiting the territorial impulse so common in breeding birds, which drives each pair to establish an estate, on which they "keep themselves to themselves" and from which they drive off all strangers; while in the fieldfare this fundamental instinct only functions sufficiently to break up the large flock into its component units, which latter find so much pleasure and comfort in each other's company that they keep together.

No one who has devoted any time to watching birds and beasts can doubt that the social species derive great pleasure and comfort from society, gaining boldness and confidence from the presence of their fellows.

I know no bird more shy and retiring than a nesting redwing, nervous of every little thing, easily frightened, and ready on the slightest alarm to desert its nest and eggs, even its young ; yet in the large winter flock it hops boldly about the open fields, no more shy than other birds.

The colony-nesting fieldfare is comparatively bold, shrieking abuse at anyone going near the nests, and flying about them with much excitement. But in the winter flock its behaviour is much that of the redwing.

As a further illustration of the feeling of security that social birds derive from the presence of their friends, I must take the puffin, which species is one of those that are more social at the breeding season than at other periods of its life-history. There is a very large breeding colony of puffins on Skomer Island, Wales, and when working on the island in 1925, I was much struck by the way the puffins varied in their behaviour. Some days, particularly settled fine ones, when conditions were anticyclonic and the glass was rising, the greater part of the puffin population would go down to the sea, to there ride in happy idleness on the waves, so that the water was dotted with hundreds of thousands of birds that floated in a broad band all around the island. Only a few, those busy with nesting affairs, were left ashore. These puffins were comparatively shy and nervous. They eyed the intruder apprehensively, and when I tried to stalk one or two, with a view to getting photographs of them, they did not wait to be snapshotted, but spread their

little wings and ran off down the slope, their orange feet twinkling in the sun, until, gaining pace, they rose in the air and flew off to join their fellows on the sea. The few puffins on land were shy and cautious, and a morning's work only resulted in two photographs taken with a long focus lens.

The next day, despite the fact that the weather was fine with a light breeze, the glass began to fall and the puffins to come ashore. By evening every slope was thickly dotted with them, and they were congregating in groups on the rocks. The next morning it was puffins to the right of you, puffins to the left of you, puffins everywhere, especially along the southern cliffs, where they stood in serried ranks looking down upon the sea. Sallying forth with a camera, I found an extraordinary change in the birds : they were now as tame and confiding as they had previously been shy. Emboldened by each other's company, they regarded me inquisitively with their dark eyes in their quaint triangular setting, showing little, if any, alarm at the camera, and allowing me to fire off plate after plate. At last, tired of photographing puffins singly, puffins in groups of hundreds, puffins preening themselves, and puffins dozing in the sunshine, I sat down to have my luncheon, to the amusement of the assembly.

Utterly fearless, they sat and watched me, or simply forgot me, and went on about their affairs. Some were popping in and out of the nesting holes, others were standing surveying the world—bracken, bluebell, and nettle-covered slopes, grey rocks, black cliffs, and the ever-changing sea, first green,

then blue, then pearly grey; while the majority, as described before, simply idled about; and the rabbits, made bold by their example, came out from their burrows and fed fearlessly among them.

The whole scene, puffins and rabbits, was an impressive example of the comfortable sense of security that companionship gives to individuals of a social species.

Though with no bearing on the point under consideration, namely, the effect of numbers on the behaviour of the individual, I must add that the reason of such great numbers of puffins being ashore was apparent before evening, as the wind began to freshen, and by night a gale was tearing across the island. It blew strongly for the next twenty-four hours, and it was evident that the birds must have had some inkling of the coming disturbance. As soon as the storm began to abate they returned to the sea.

The puffin is one of the species already referred to as being more social at the breeding season than at other periods. As soon as the young can leave the nest-burrows and go down to the water, the great gathering begins to break up. The puffins depart for the open sea, across which they roam in small flocks, and yet smaller parties, until the approach of another breeding season lures them back to the old nesting place.

The same remarks apply to such birds as the common guillemot, the razorbill, kittiwake, fulmar petrel, gannet, etc. All these birds are comparatively unsocial during the autumn and winter,

when their huge nesting colonies are considered. The gatherings at the breeding places are enormous. The reason for behaviour so diametrically opposite to that of most land birds obviously lies in the scarcity of suitable nesting places, the birds having to choose between crowding into circumscribed areas or failing to produce young; while the abundance of food close to the breeding site makes crowding feasible for these species.

Returning to species which scatter to breed, but flock during the winter: these afford us an example of the warring of the territorial impulse with the social one. The pleasure the chaffinch, for instance, derives from the companionship of its fellows is, during the spring months, overridden by the instinct to establish a territory and keep this estate free from trespassers.

Once the great business of rearing the young has been achieved, the chaffinch, linnet, greenfinch, etc., can happily join its fellows; just as the tit families, amalgamate into one flock; the rooks draw into the big rookery; the lapwings join forces, and seek new feeding grounds; and the starlings congregate in immense gatherings. The moorland and marshland birds also gather together for a change of feeding grounds, immense flocks of waders resorting to the seashore; while the ducks of various species, leaving the places where they were reared, resort in company to the larger sheets of water and there enjoy each other's company.

Many species normally non-social in the wider sense, being usually content with the limited society

of the family, may flock under stress of bad weather ; the coot, for instance, will, on the Norfolk Broads, gather into huge flocks, though on more circumscribed waters you rarely see more than a family group.

Turning from birds to mammals, we find the social impulse common among the ruminants, being, indeed, the rule throughout their ranks, having probably its origin in mutual defence against predaceous beasts, the advantages of the communal life for such comparatively defenceless creatures as deer, goats, wild sheep, etc., being obvious. But we find the social habit almost as highly developed in the ranks of the aggressors, the wolf pack being the outstanding example. Again, the advantages of combination are obvious, and in the case of the different species of African hunting dog, it is doubtful if solitary individuals could get a living ; certainly they could not pull down big game.

But it is as a defensive measure that combination has the highest survival value, and therefore it is by no means surprising to find wild horses, zebras, antelopes, bison, elephants, and a host of other creatures, to say nothing of monkeys and lastly of man, gather in herds or flocks. We might almost commit ourselves to the generalization that the majority of the larger non-carnivorous mammals are of social habits ; and that they all seek and enjoy the society of their fellows.

This short and superficial survey shows us what a force the social impulse is in wild life, how it is the rule rather than the exception for creatures to be

"SAFETY IN NUMBERS"—A PUFFIN COLONY

1 Two puffins, very shy and nervous
2 A throng of puffins, bold and confident in each other's company

subject to it, and that there are few which do not feel it at some period of their lives.

The social mammals submit to it throughout their days, only leaving the herd or pack under exceptional circumstances, as when the female is about to bear young; while the birds show more variety, some being more sociable at the breeding season, as the seabirds, and others, at that period, becoming solitary and deserting their fellows, though they rejoin the flock in the autumn.

But the problem which interests us here is not so much the actual behaviour of the bird or beast as why it seeks its fellows, and its feelings about its fellows; in fact, we are seeking to understand the mind of the social creature.

We may be quite sure that the rook or puffin, wolf or antelope, does not think anything definite, it does not form hard-and-fast ideas as we do, i.e. form concepts, but that will not prevent it having fairly definite feelings about the matter.

The actions of the puffins give us a clue to the attitude and feelings of such creatures, when alone and in company; very similar, after all, to those experienced by the most social species of all, namely, ourselves.

The puffins that were by themselves were fidgety, restless, continually looking about them, and were ready to take alarm at anything or nothing—in fact, they were uneasy.

When they were all together they were happy and contented, confident and not easily alarmed. To say they showed "confidence in numbers" was just

a statement of the facts. We shall probably be quite correct if we say they were filled with an enjoyable contentment and, without exactly thinking about it, felt pleasurable satisfaction at the presence of other puffins, combined with an absence of worry and anxiety.

It will be the desire to experience this pleasurable feeling that is the actual incentive which brings the individuals together. Together they are happy, singly they are unhappy.

Watch a feeding starling flock, or the concourse going down to roost in the bushes at night, and the happy twittering contentment of the gathering is something to remember. But, though the individuals doubtless experience great pleasure in being in company with their friends, this does not alter the fact that the social impulse is an instinctive one, brought about through the action of evolution, an instinct of great utility and survival value.

It may be added that sociability is the foundation of progress, and that many social species are of a high mentality. The dog undoubtedly owes his intelligence to the ancestor that ran in a pack, and we may ascribe his devotion to his master to that impulse to follow which is the foundation of the pack. Without a pleasure in society there would be no pack, herd, nor flock, and that pleasure and allegiance the dog has partly transferred to man. In his company he has that pleasant sensation of well-being and safety that is the root of all flocking, herding and gathering together. This feeling is in the cat only present in a very minor degree—she

is a predaceous beast that has always hunted alone; hence the cat is indeed "the cat that walks by herself through the wild woods." But the truly social creatures are not happy when they are "walking by themselves"; their nature calls for company, which they obtain by gathering together. And this desire for society is only overridden in the breeding season by the territorial impulse, which in many species drives the bird or beast into comparative solitude.

CHAPTER XXI

TAMENESS, WILDNESS, AND FEAR OF MAN

FEAR of man, or rather actions that to the casual observer would seem to indicate fear of us, are so widespread in the animal kingdom that we are apt to regard wildness as an integral part of all undomesticated birds and beasts, and to consider fear of the human race as truly instinctive. The very expression "wild animals" shows our attitude in the matter. To most people animals are either tame or wild, and they are commonly spoken of as having an instinctive dread of man.

It is certainly true, sadly true, as we all know, that the majority of vertebrate creatures, indeed nearly all those of any size, found in well-populated parts of the globe, and even those in the more sparsely populated parts, flee from a human being as from the Devil!

That such timidity is not an original characteristic, and that our fellow-inhabitants of the globe were not originally so nervous and fearful as they now are, may be judged from the behaviour of birds and beasts on uninhabited islands that have had little

or no contact with man; e.g. take the following paragraph in which Darwin describes the tameness of the birds of the Galapagos Archipelago as seen by him in 1835. He says: "I will conclude my description of the natural history of these islands by giving an account of the extreme tameness of the birds.

"This disposition is common to all the terrestrial species, namely, the mocking-thrushes, the finches, wrens, tyrant flycatchers, the dove, and carrion-buzzard. All of them often approached sufficiently near to be killed with a switch, and sometimes, as I myself tried, with a cap or hat. A gun is here almost superfluous; for with the muzzle I pushed a hawk off the branch of a tree. One day, whilst lying down, a mocking-thrush alighted on the edge of a pitcher, made of the shell of a tortoise, which I held in my hand, and began very quietly to sip the water; it allowed me to lift it from the ground while seated on the vessel: I often tried, and very nearly succeeded in catching these birds by the legs."

He goes on to speak of the destruction of these tame and confiding birds by visiting sailors, and adds: "In Charles Island, which had been colonized about six years, I saw a boy sitting by a well with a switch in his hand, with which he killed the doves and finches as they came to drink. He had already procured a little heap of them for his dinner; and he said that he had constantly been in the habit of waiting by this well for the same purpose."

Farther on Darwin remarks that the "Falkland Islands offer a second instance of birds with a

similar disposition. The extraordinary tameness of the little *Opetiorhynchus* has been remarked by Pernety, Lesson, and other voyagers. It is not, however, peculiar to that bird; the *Polyborus*, snipe, upland and lowland geese, thrush, bunting, and even some true hawks, are all more or less tame. As the birds are so tame here, where foxes, hawks and owls occur, we may infer that the absence of all rapacious animals at the Galapagos is not the cause of their tameness here. The upland geese at the Falklands show, by the precaution they take in building on the islets, that they are aware of their danger from the foxes; but they are not by this rendered wily towards man. This tameness of the birds, especially of the waterfowl, is strongly contrasted with the habits of the same species in Tierra del Fuego, where for ages past they have been persecuted by the wild inhabitants."

He concludes the chapter (chapter xviii. of the *Voyage of the Beagle*) with the following statement: "We may, I think, conclude, first that the wildness of birds with regard to man, is a particular instinct directed against *him*, and not dependent on any general degree of caution arising from other sources of danger; secondly, that it is not acquired by individual birds in a short time, even when much persecuted; but that in the course of successive generations it becomes hereditary."

From this we see that Darwin regarded fear of man as instinctive, the experience acquired during the individual's life being transmitted to the offspring and becoming an instinct.

We have already seen that there is reason to doubt whether acquirements, especially mental ones, and habits in particular, do in fact ever become hereditary ; and will return for a moment to the absence of fear of man in species unacquainted with him, referring this time to the sea-lion.

It is of the tameness of the sea-lions of the Galapagos I wish to speak, though quoting this time not from Darwin's book, but from a much later work, namely, from *Galapagos: World's End*, by Mr. William Bebe, who visited the Islands in 1923. He found the sea-lions, which were numerous, without any fear whatever of man, being only possessed by a great curiosity, though they were wary enough where their natural enemies, namely, sharks, were concerned. But of the exploring scientists they had no fear, neither old nor young ones displaying any other emotion than that of surprise and amazement. Mr. Bebe tells how he was wading along the shore of one of the Guy Fawkes Islets, looking for chiton shells, and says : " I went on with my chiton prying, greatly to the edification of the four young seals, who, gathered in a circle not more than six feet away, never missed a movement of mine. Again and again one would swim forward under water and muzzle my fingers to find out what I was trying to do. At last, having overcome the powerful suction of the shell, I walked along the series of pools with the young seals keeping alongside, eager to see what would happen next. On an outjutting flat rock, which seemed the day nursery hereabouts, were several mother seals suckling their young.

"A huge male milled about in the surf outside and expressed his disapproval of me in mighty roars, but the dozing mothers vouchsafed me but a single glance, and went promptly to sleep again, with an occasional protest to their disturbing spouse. Another female lay half in and half out of the water in a shallow tidal lagoon. Every incoming wave would gently lift her and her baby, hold them suspended for a moment, and then quite softly replace them on the seaweed-padded rock. When this baby spied me his curiosity overcame his hunger and he dived straight for me. Instantly two of his companions raced for the vacant cradle or lounge, or whatever one may call it, but their striving anxiety defeated their purpose—they bumped into the mother, thoroughly roused her, and with a roar of anger at these changelings, she chased them away. The rightful pup had by this time satisfied his curiosity, and with a rush returned for dessert." (Pp. 104, 105.)

Now what a contrast is the unsophisticated behaviour of the sea-lions of this uninhabited archipelago to that of the seals met with in other parts of the world, such as the common seal (*Phoca vitulina*) and the grey seal (*Halichœrus grypus*) of British waters.

Both these seals are very shy, and for breeding purposes resort to the wildest and most ungetatable parts of our coasts, such as the outlying islets and storm-beaten skerries. Far from indulging in any undue curiosity regarding the spectator, they take the greatest care to keep a good distance from him.

THE YOUNG GREY SEAL THAT WEPT WITH FEAR

I shall never forget a visit paid to the West Coast of North Roe, Mainland, Shetland, for the express purpose of seeing common seals and their young. After a long tramp across the wildest of moorland, the guide led my friend and I to the seal bay, where the seals, he said, brought their young ones. From the top of the great cliffs, rising three to four hundred feet in sheer walls of red granite, one looked down into a narrow cove, and upon a small expanse of red shingly beach far below. Upon it the great rollers were breaking with a roar that came up to us muffled by the distance. The sea looked deep green, vivid green, by contrast with the blackened rocks against which it broke and the red cliffs above. In and out of the foaming white of the breakers swam and crawled what from the height above looked like small black slugs—they were the seals ! There were young ones as well as adults, for we could see the pups beside their mothers. The little things were playing round their dams, rolling and tumbling in the water, like puppies round a bitch. But besides the seals in the sea there were others on the beach, for under an overhanging rock lay what looked like more black slugs. Our guide, who went farther down the cliff than we did, said there were at least a dozen, but I could not see so many. There were also, as already mentioned, several seals in the water, both single ones and mothers with young ones by their sides. These latter wanted to get their babies ashore. The way they tried to do it was to float in on a breaker, when both dam and pup were washed up the beach and left stranded on its shingle as the

roller broke and ran back. But whereas the old one quickly floundered higher up out of reach of the succeeding wave, the baby was slow, and was caught by the next wave, which invariably washed it back into the sea, when its anxious mother would look round, see it had vanished, flounder back, plunge into the water, and swim out after it. It did not take her a minute to find it and bring it back shorewards once more, to again try her luck. One old seal tried six times, and six times her little one was carried out again, but at last perseverance was rewarded, and she got it not only ashore but high and dry, when she rolled over on her side and lay with the youngster beside her. So far above were we, that we could not see for certain what was happening, but I think she was suckling it. At this time the other mother seals were trying, without success, to get their babies likewise up the beach.

I have described this scene in detail to enable the reader to realize the wild haunts of this seal, this particular spot being one where the animals might well fancy themselves secure, and to show how occupied, indeed preoccupied, the old seals were by family cares, so that one would have expected them to be indifferent to any slight disturbance. Yet what were the facts ? Though we were so far above, and were not talking loudly, the seals took alarm. They either saw, smelt, or heard us, despite the fact that we thought it impossible for them to see us, that the wind was blowing in from the sea, and we were little more than whispering. One by one they shuffled down into the water, until at last the beach

was clear, but we could still see them floating in the surf, the babies playing round and keeping close to their mothers, who appeared most anxious about them. Somehow or other those old seals had become aware that there were human beings about, and so immediately left their hard-won and comfortable resting-places, to retreat to the safety of their native element.

Take again the grey seal. This large species breeds in the autumn, resorting to the most inaccessible islets, where one would think it would be safe, guarded as it is by the winds, storms, and rough seas of October and November, yet in fact it is much harried and persecuted, for fishermen and crofters value the oil obtained from its blubber. To see this seal at home I paid a visit to an island where a certain number were reported to come each autumn. It was a wild and wind-swept spot, cliff-encircled, and protected by fierce tidal currents. On one side of the island was an indentation—one could hardly call it a bay—known as the South Haven, and here the seals were said to have their headquarters, which was borne out by seeing several floating up and down in the troubled waters. One, a very large one, looking black in the transparent water, had a smaller and lighter seal beside it—undoubtedly a mother with her cub, evidently an early-born pup that had already taken to the water. Beyond, as already said, were other seals, some big, some medium in size, and some, again, quite small, but all examples of the great grey seal, not one specimen of the common seal being seen.

It was not until the following morning that I made closer acquaintance with one of the young ones, when three of us spied from the cliff-head a small seal lying asleep, high and dry in a little cove. He was lying on the sand, close under the overhanging rocks, motionless in soundest slumber. No doubt the old one had left him there while she went off fishing.

We hurried along the cliff-tops, to a spot where it was possible to scramble down, and then, sliding and bumping, descended hastily, for I wanted to get a snapshot of the youngster before he took fright. Even in the distance it was obvious he was not a very small cub. When first born the grey seal is clad in a silky white coat, and for a period, varying according to circumstances, does not enter the water, though capable of swimming if it has to. Under normal conditions it is undoubtedly ten days or more before it takes to the sea; when the white puppy coat is shed and the iron-grey dappled velvety pelage of the adult is assumed. This young one had got his new coat, and was a big pup of between six and eight weeks old.

Still he slept on as we scrambled down the rocks, lulled, no doubt, by the heavy murmur of the sea, which drowned all other sounds; but our clatter over the boulders woke him. He woke to see strange beings, such as his young eyes had never seen before, running across the little beach, and bounding over the boulders, to get between him and the sea.

Now had he been a pup of the Galapagos sea-lion

he would have been intensely interested and inquisitive regarding us. He was not; he was just badly frightened. It is highly improbable he had ever seen a human being before; he could not have had the slightest idea of the extreme dangerousness of the species, nor was his mother at hand to give any warning or utter an alarm; yet he was as much scared as if he knew all about it, about fishermen, and guns, and other dangers pertaining to the bipeds that had descended into his peaceful world.

He reared himself on his fore flippers and regarded us with his great dark eyes; then, evidently resolving to do and dare, he began to heave himself towards the person who blocked his way seawards. Hump and heave he came, the personification of awkwardness, yet advancing at a pace that was sadly demoralizing to the camera. One of my companions picked up a piece of driftwood and endeavoured to stay the youngster's progress by brandishing it before him; but the little seal was not so easily daunted as that. He grabbed at the wood and bit it with all his might. Though his mouth was only furnished with small milk-teeth, he bit with such good will that the wood was deeply indented with teeth marks. He bit again and again, while his great dark eyes filled with tears of fear and rage, which coursed down his face, making dark rivulets through his velvety fur; for seals are some of the few creatures that share with man the distinction of crying when deeply perturbed. This poor young seal wept copiously with fright, especially when I grabbed him by his hind flippers and dragged him back up the

sand. The tears ran rapidly then, and I felt a perfect brute to frighten him so much. But the photographs having been taken, he was able to scuttle off to the water, which he did as fast as he could caterpillar himself along. Off he went, humpty, bumpty over the stones, slid into the sea, and vanished, no doubt to find his mother and forget his troubles.

Poor youngster, what a dreadful experience it must have been for him, terrifying from the moment we descended the cliff, and still more alarming when he found his retreat barred. But *why* was he so afraid? Did he really know what we were as soon as he saw us? Why was he not merely interested like the sea-lion pups? Did he say to himself as we ran across the shingle, "These are human beings, and some human beings shoot seals"? Certainly he behaved as if he did. That he was terrified no one could doubt, but the question is, Was he afraid of us as human beings, or as something strange and therefore awful? I believe the latter, for, as already remarked, it was almost certain he had never seen a person before, and to credit him with instinctive knowledge, inherited knowledge of man and his awfulness, so that the minute he saw us he said to himself, "Here are men and women coming, who will kill me unless I get away into the sea," is to credit him with something at complete variance with what we have learnt about instincts and the inheritance of acquirements. Knowledge resulting from education belongs to the individual, and no convincing evidence that it can be transferred from the soma to the germ plasm, and thus incorporated in

the make-up of the succeeding generation, has yet been brought forward.

We may, therefore, be fairly confident that this young grey seal did not fear us through experienced conscious knowledge of the human race that had been handed down to him from his parents, but just from sheer timidity of anything strange; that it was just unthinking, unreasoning panic that animated him as he tried to bolt seawards, a panic arising from his nervous temperament, which predisposition to fear, to rush away from the unusual, was a true inheritance, an instinct handed down through countless generations, and an instinct, as I shall presently show, that has undoubtedly been evolved through the persecution of animals by man. On such a foundation of constitutional timidity each individual accumulates experience, direct and from the warnings, example, and behaviour of its parents and fellows; hence by the time they are adult many animals do fear man as man, because they know what he is, and not merely as something strange and startling.

In this respect it will be useful to compare the actions of adult grey seals with those of the young one which was making his first acquaintance with human beings, so I will describe how we watched a party of old ones.

Scrambling back up the cliff, we saw five huge seals, one of which was very large, lying on some rocks farther along the shore. The party appeared to consist of an old male and four females. He lay in the middle with two ladies on either side. They

were stretched out in attitudes of perfect peace and contentment. The sunshine glistened on their spotted coats, and on the white-topped waves that broke against the rock. The old fellow, in particular, was a picture of prosperous content—until one of the females rolled over and bumped him in the back, when he snapped at her in the most irritable way. He was a trifle darker than his mates, but one of the females was exceptionally light—in fact, she was really white—and in the sunlight her coat shone like silver.

There they lay, a picture of peace and security, slumbering in the sunshine, yet really sleeping " with one eye open," senses only slightly dulled, and ready at any instant to spring up wide awake. The young seal had allowed us to get quite close before he noticed us, before he woke up and realized we were there. These adults, even in their sleep, were on the *qui vive* for danger. Watching them, we forgot our precautions, and raised our voices. In an instant the seals were sitting up, with heads raised in keen attention. Yet another moment and the sleeping-place was vacant, while resounding splashes, like those of rocks falling into the sea, rose to our ears. A few heads bobbing on the waves, and the five seals were gone.

To turn from seals to more homely creatures, such as our hedgerow birds, it is generally assumed that they manifest an instinctive fear of man, even the young in the nest cowering down at his approach, or, if old enough, tumbling headlong from their cradle at the sight of him. I have a very vivid recollection

THE OLD GREY SEALS UPON THE ROCKS

of the flight of some young bullfinches. I had a photographing tent erected near, and from its shelter had been able to watch the old birds feeding them, and conducting their family affairs in happy ignorance of the proximity of a human being. Very fascinating had the dainty little grey, white, black, and salmon-pink birds been to watch; and I had seen the young ones change from blind helpless mites to feather-clad youngsters with keen dark eyes, that crouched motionless in the nest during my comings and goings. Once I was out of sight, they were restless enough, wriggling about in the nest, stretching their little wings, preening themselves, and looking out inquiringly at the world. Then there came a morning when I appeared suddenly through the bushes. Those nestlings had seen me many times previously, but with one accord they tumbled out of the nest and fluttered, chirping, into the bushes. They were gone into the wide world of woodland greenery, gone at the sight of a human being, but for whom they would certainly have stayed a day, two, or even three days longer in the nest. Like the young seal, they bolted at the sight of man. But the question again is, Did they fear a human being as a human being, or as something strange and startling? Would a cow have had the same effect?

Many more instances of the same sort could be given, scores and scores of them, and the reader can multiply the examples any spring day when he has the leisure to walk down the nearest hedgerow and experiment with young thrushes, blackbirds, hedge-sparrows, robins, etc., etc. That his

appearance inspires all the nestlings that are sufficiently developed to be able to see and comprehend what goes on around them, with the greatest fear, he will be able to prove again and again.

With the sole exceptions of some two or three small species (robin and certain tits) the adult birds betray even greater fear, and flee before him, the blackbird's shriek of danger never rising more shrilly than when it flees from man.

What a contrast to the accounts we have quoted of the behaviour of birds in the Galapagos! Many similar descriptions from early writers might also be quoted of the tameness, utter fearlessness indeed, of the so-called wild life in uninhabited lands and on unoccupied islands when these were first explored. That such confidingness has usually led to the slaughter of the innocent creatures by cruel and brutal sailors, or other explorers, is beside the point. The point is that tameness and timidity in wild animals is directly correlated with the human population (save for a very striking exception). Where that is, or was, nil, the birds are, or were, quite tame and fearless of man. Where men visit regularly, and in all populated parts, the wild creatures are wild indeed, being the personification of timidity.

We must now turn aside from the main argument for the moment to consider the exception referred to, which is the birds that live in the parks of some large towns, the birds of the London parks being an example. There we may see what the country dweller regards as the shyest of wild birds, namely,

the wood-pigeon, stalking about with the utmost confidence, and with no regard whatever for the people on all sides. To me the wood-pigeons in the parks are the most wonderful sight in London, for they testify to an extraordinary change and enable us to see evolution at work on man and bird. The country man is still a predatory animal, hunting and slaying the living things around him, from the boy who throws stones at the hedgerow birds, to the squire who goes out with his gun and his dog. But the town dweller has changed—killing is unknown to him; he is no longer predatory where other species are concerned, and has no designs on birds and beasts, which it gives him keen pleasure to watch and feed, so that the parks of our great towns have become veritable sanctuaries for wild life. It would seem as if birds know that they are safe there. Yet probably they never *think* about it at all.

To try to get some understanding of exactly why the timid wild creatures of our countryside and other populated parts of the globe flee in terror from man, we must return for a moment to the callow bird, which may supply us with an answer to the question, Fearful as man is to birds and beasts, do they in fact fear him because he is *man*? We have seen that the most timid species become used to him in the London parks.

Now with regard to young birds, that they regard our sudden appearance at the nest-side with horror is undoubted, but there is a great deal in that word "sudden." Approach gently and quietly, with due

precautions not to startle them, and the nestlings manifest little or no alarm. There is no recognition of man as man, only fear of the strange and unusual, especially that which moves quickly and startles them. Raise any object suddenly near the nest, and it will have the same agitating effect as a sudden view of the human face. Take my tame otters as another example of the effect of the strange and unexpected. The otter is naturally a shy and wary beast, but my pet otters, having been associated with people from their earliest days, are quite domesticated, yet any sudden or unexpected incident will make them behave like wild animals. For instance, I have seen Moses, the old female, busy fishing when I have appeared unexpectedly on the bank above her, and she has instantly dived and hidden under the bushes, only to come out again and rush to me at the sound of my voice. Had she been a wild otter, you would have said she fled at the sight of a human being, but, knowing her, one was aware that the order of the impressions on her mind must have been something like this: Something there—fright—dive—come up and look round—only "the Missus!" Again and again have I been struck with the intense suspicion these otters display towards anything unusual, especially anything which moves sharply or suddenly; and that is the attitude of most wild things: they are intensely alert for the unusual, especially that which moves quickly, but that which moves quietly is not nearly so alarming. We all know how feeding rabbits flee before you when you are walking across the meadows, yet those

same rabbits take little notice of the person who approaches them gently, a step at a time, slowly and quietly. Thus approaching, you may get very near before the rabbits give the danger thump and race for home ; while if you stand quite still, absolutely still and inanimate, they will go on feeding around you as if there was no such thing as a human being within miles of them.

That alarm is associated with sudden movement was brought home very forcibly to me one day by the sight of a black cat stalking some rabbits. The rabbits were busy eating in a sunshiny spot under the shelter of a tall fence, and right in the middle of them crouched a large black, poaching cat. Not a rabbit took any notice of tom, though they must all have seen him. One washed its face, passing its paws over its nose, while the others ate or hopped about, and another cocked its ears as the cat got a little closer. But there was no alarm, no hurried scamper home, merely complete indifference to the poacher in their midst. That which moved so quietly did not worry them in the least. Undoubtedly the cat would have sprung on one of them, but a man came along, whistling as he walked, and the rabbits bolted, while the cat slunk into the hedge.

Certainly those rabbits had not shown the slightest fear of the cat or recognition of it as a danger. A cat, as a cat, had no meaning for them.

The same thing applies to hawks. I have seen a hawk sitting motionless in a tree, with finches and tits going happily about their affairs above and

below it. While the hawk sat quiet it had no meaning as a hawk for them. It was only when it took wing that they hurled themselves, panic-stricken, into the bushes below.

That ducks and fowls have no hereditary knowledge of their ancient foe, the fox, I am quite convinced, for I have experimented on them with a tame fox. This was Toby, the hand-reared vixen, that I used to take through the farmstead. Some of the hens would cackle at the sight of her, and follow for a few steps as if to get a better look at her ; but it was the ducks (tame mallard) that took the most interest in the fox. After the inquisitive manner of their kind, they always came to have a look at Toby, quacking excitedly and following her, but they were not more excited than they would have been by a strange dog. These same ducks were much more alarmed at the otter, apparently because she followed them into the water and chased them down the pond ; however, they lined up on the banks to watch her, and followed her up and down the pool-side as she swam to and fro.

Many other instances could be given of animals not recognizing predatory beasts as dangerous, and of indifference to human beings when they keep quite quiet or go about their business sedately and soberly (the cunning and wary rook will follow close on the ploughman's heels to pick up the worms from the newly turned soil), while examples of their alarm at the sudden and unexpected could be given by the score ; but enough has been said to show that the extreme timidity of wild creatures, and the way

they flee from mankind, is not due to an instinctive recognition of man, as man, being dangerous, nor that they have an instinctive particularized knowledge of other foes, but is due to their temperament, to that extreme nervousness, timidity, and wildness which has made them prone to rush, panic-stricken, from the presence of the unusual. And the apparently greater fear shown of man than of other creatures that kill is not necessarily due to knowledge of what he is, but may be attributed to his restless activity and sudden movements, which startle the timid birds and beasts. Predatory mammals move, as a rule, quietly and stealthily, and therefore do not startle their prey, while the domestic animals of our fields inspire confidence by reason of their sober, steady ways. A starling perches happily on a sheep's back because the sheep does nothing suddenly. Such animals do not upset the high-strung nerves of timid wild creatures.

It is this nervous temperament which has enabled the bigger birds and beasts to survive. Only on lonely islands have tame, bold, not easily alarmed species been able to hold out. Elsewhere man has killed them off. For a considerable period, even as years go in the history of this earth, the human species has been preying on birds and beasts, and the present wildness of the surviving species is due directly to this warfare, for only the most timid and wary kinds have been able to elude their persecutor and leave descendants, and of them only the most timid and wary individuals. To put the

matter in a nutshell, it has been a case of the survival of the shyest.

Whether experience can ever be inherited, whether what the parents have learnt can become an instinct in the young, is a point which, as repeatedly mentioned, is more than doubtful, and dreadful as have been the experiences of animals at the hands of man, we have no reason to suppose that the young come into the world any wiser concerning him than their parents were when they were born. Each individual has to find out for itself, but it is equipped with a horror of the strange (if it be a moving) thing, which is nearly as useful, so that the young grey seal hurries off to the sea at its first sight of a human being, and the nestling birds hurl themselves from the nest into the heart of the nearest thicket, both fleeing from man and hiding as if they knew all about him.

At this point the reader will probably object that in the mobbing of owls, and sometimes of hawks, and cuckoos by small birds, ditto of foxes and cats by jays and magpies, we have direct evidence of instinctive and particularized knowledge of what may be termed a *natural* enemy, but I must protest that I consider the word "natural" to be misused when so applied, man being in reality quite as natural a foe as hawk, or owl, or fox.

But, as a matter of fact, I am quite sure that these demonstrations by birds do not betoken fear, or anything more than excitement at something strange, and they must not be taken as evidence of fear, still less of particularized instinctive fear of certain

birds and beasts—fear from experience is another matter. Owls, for instance, do not usually move abroad in the daytime, and when they do are strange objects to other birds, which crowd round them in obvious excitement, chattering, chirping and shrieking, according to their kind, while the bigger and bolder species do not hesitate to attack the bird of the night. I recently saw an owl fly out of a tree followed by some chaffinches and other small birds, when a mistle-thrush appeared, and, with a shriek of abuse, flung itself at the softly sailing owl. Some of that tawny owl's brown feathers floated away down the wind as it turned and twisted to escape attack, which it only did by dropping into a thick fir-tree.

The way jays and magpies chatter at a fox is open to the same interpretation. The fox does not even bother itself to try to catch such birds, but they always shriek at it when they see it abroad during the day, and they likewise chatter at and follow through the tree-tops any wandering cat or dog, which it cannot be contended are foes they especially fear.

The occasional mobbing of a hawk or cuckoo seems to be based on some special cause for annoyance, not always obvious to the observer, but not on fear, for when birds fear a hawk there is no doubt about it. Then their actions are very different : they either fling themselves headlong into the nearest cover, such as a hedge or long grass, or squat flat to the ground, crouching motionless until the danger is past.

My interpretation of birds mobbing such creatures as owls and foxes is that they are excited and curious, very inquisitive and annoyed rather than afraid, just as the ducks were immensely curious concerning the tame fox. This also applies to them following a hawk and the hawk-like cuckoo, which on the wing has a most deceptive likeness to a bird of prey (witness the old country superstition that cuckoos turn into hawks in the winter !).

But, though I contend that neither birds nor beasts say to themselves, "That is an owl, which is dangerous, let us warn the neighbourhood," or "That is a fox, which might kill one of us, let us give the danger call"—their fears never being crystallized, concrete, and conscious ones like that—they have some panic impulses which are more directional than their general timidity of that which is strange. The best known instance of this is the dread of an object, more especially a moving object, above them. Most birds, and nearly all the rodents, fear anything passing overhead. That this is truly instinctive and is a safeguard against hawks and other birds of prey is obvious.

I have found that all the British field-mice react instantly to anything moving above, for I have experimented with long-tailed mice (*Apodemus sylvaticus*), bank voles (*Evotomys glareolus*), and meadow voles (*Microtus agrestis*) with always the same result. The mice, which were fairly tame, especially the voles, would be feeding happily in their cage, paying little attention to what was going on around them, even when you tapped the glass side to draw their

attention, yet if you showed as much as a finger over the cage-top they bolted instantly. Again and again I tried the experiment, but the result was always the same: noise and movements alongside them did not alarm them, but the least thing stirring overhead caused a panic.

It is the same with birds, the majority of which dread any small dark object sailing overhead. Who has not seen an old hen, when she is mothering a brood of chickens, catch sight of a hawk passing over and instantly give a curious call, that causes the chickens to crouch flat and remain motionless until the coast is clear? I used to think the hen recognized the hawk for exactly what it was, but after I had seen a hen madly panic-stricken by a piece of paper that floated over on a gust of wind, dashing under a bush and there crouching with her brood around her, I was not so sure, and experiments with tame hawks have convinced me that the alarm centres on a dark object passing over, or an unusually coloured object hanging in the air. A child's kite, like nothing that lives on earth or in the air, will reduce the birds of a wide area—all those that can see it, in fact—to the wildest panic, the field birds, such as partridges, crouching motionless in frozen terror (so that you can literally kick them up before they will move), and the hedgerow and woodland birds diving into the thickest covert available.

The fact that birds do not recognize a hawk while it sits still has already been alluded to, and I confirmed it by taking both large goshawks and tiny

merlins through the farmyard. The poultry had no interest in either the big hawks or the small ones so long as they sat motionless on my wrist, but if they bated, i.e. flapped off the fist, great excitement was engendered ; while if a goshawk flew over the stackyard all the hens rushed under the barn, but they took no notice of the small rather pigeon-like merlin when one of these was put on the wing. I must add that I have seen poultry, wild birds (thrushes and blackbirds), and ducks greatly alarmed by a heron flapping over, and by a pair of great black-backed gulls soaring so high they looked but specks in the sky.

From this it will be seen that my original contention that birds do not fear a hawk as a hawk is borne out by the evidence. What they fear is something in the air, especially something unusual, and that this disposition to panic at anything unexpected overhead is truly an instinct, part of their hereditary organization, we cannot doubt, but education does much to intensify it, as when the old bird instructs her chicks, by means of her warning note, that danger is nigh.

That animals learn to fear, as well as having fear innate in them, is known to all who have tamed, or tried to tame, the timid creatures of the wild. Parental example is powerful, and if you can take a little creature before its mother has taught it caution, and before its instincts have been roused, and bring it up among human beings so that they are the everyday objects of its life, then it will be as tame and confiding, and seemingly as devoid of

fear, as our placid-tempered domestic animals which have lost the nervous temperament of the wild; *but* should anything unforeseen happen, should the tamed animal be accidentally alarmed, all its innate timidity will leap to life, and it will flee in as great a panic as the wildest of the wild, for its tameness is only educational.

Education has played its part in the taming of the birds of the London parks, for not only are they free from persecution, but the old saying, "Familiarity breeds contempt," is true of them. With people on all sides, always there, always passing to and fro, man has become part of their usual surroundings; from the day the pigeon squabs were hatched in the smoke-blackened trees they have been used to look down upon him, and what elsewhere would be unusual, and therefore threatening, is here part of the familiar furnishing of the scene, just the ordinary objects they expect to see, and therefore not alarming.

To sum up, the attitude of wild things is that of "flee from the sudden and unusual," not through inherited *knowledge*, but through an inherited disposition to panic. In this sense their fear is instinctive, for it is almost certainly independent of conscious analysis of the cause of fear, as independent of conscious volition as the manner in which we close our eyes when anything is flourished near them. The bird flying at the sudden appearance of man is probably only conscious of being startled and of being afraid; not afraid of the person, but just blindly afraid.

For this timidity man, as already remarked, has only himself to thank. He has killed off the tamer or more aggressive species (witness the number that have been exterminated or reduced to scarcity during the historic period) and likewise the least timid individuals of the more cautious species, until by the simple process of the elimination of the bolder ones, only extremely shy creatures have survived.

But with regard to the emotion of fear, it must be remembered that though wild creatures are wild, timid and nervous, it does not follow that they are unhappy or suffer in consequence. The very fact that their fear is not particularized spares them that. We see them going about their affairs joyfully and happily, not thinking about dangers that may occur, but just liable to panics now and then. We know how fleeting emotions are with children, and it is the same, only more so, with birds and beasts. Fear passes like the shadow of an April cloud, and a few moments later the bird is singing or the mammal playing. Sufficient unto the moment is the evil thereof. It is reserved for our overgrown brain to look forward and to worry.

CHAPTER XXII

CONCLUSION

IT only remains in this concluding chapter to survey the ground covered, and make some general observations thereon.

We have seen that intelligence is an important factor, undoubtedly the most important in wild life ; that there are few vertebrate creatures which do not behave in a purposeful manner, and that in birds and mammals their behaviour is largely dictated by intelligence, for they have memories, often good ones, and profit by experience, the higher ones showing a considerable degree of educatability.

We have further seen that animals differ as much individually as we do, and that temperament and personality are found among birds and beasts.

The analogy between the animal mind and the human mind has been pointed out in the chapters devoted to " Fun and Mischief," " Revenge," and " Rage," and especially in that on " Revenge."

A special chapter has been devoted to that strange phenomenon, the destruction of her young by an excited mother, for it has an important bearing on one of our social problems.

Then instinct has been dealt with, it being shown that this wonderful force has nothing to do with intelligence, and that far from being, as so many of the older writers thought, intelligence crystallized into habit and become hereditary, it was evolved long before consciousness, and must have been one of the earliest manifestations of life; intelligence being a later product of evolution, the highest development of which we see in ourselves.

The following chapter is devoted to "Migration," because in the migration of birds we have an especially marvellous instance of instinctive behaviour, so the journeyings of spring and autumn migrants are dealt with at length.

In contrast with migration, especially the spring migration, when the travellers undoubtedly are inspired with a strong desire to return home, it is shown in Chapter XI that the supposed "Homing *Instinct*" of carrier pigeons, cats, dogs, etc., is non-existent, for in pigeons especially, the ability to find the way home is a matter of training and education—intelligent memory, combined with a sense of direction, appear to be the factors that enable the pigeon to get home.

In Chapter XII a true instinct, often modified by intelligence, namely, that which enables a bird to perform the "broken-wing trick," is described.

"Territory," which is of great importance in animal life, forms the subject of the next chapter, territorial battles between birds, etc., being given in detail.

As having an important bearing on the general

question of where intelligence ends and instinct begins, the storing habit so common in many species of birds and beasts is fully discussed, many observations bearing on it being given.

Nest-building by birds has been given a chapter to itself, showing that though the building, or otherwise making of a nest, is a true instinct, quite independent for its performance of any experience on the part of the bird, it does not exclude the use of intelligence, which will step in to modify the result.

As having a bearing on the question of cruelty in Nature, the "Mind of the Hunter" has been discussed, it being shown that *wilful* cruelty is only found in man.

In Chapter XVII, on "The Horse," it was shown how story and fancy may weave a reputation round an animal that it does not deserve, and that, far from being a sagacious beast, the average horse is peculiarly foolish and at the mercy of every passing impulse.

"Flock and Herd Movements" have needed a chapter to themselves, because of the suggestion which some observers have put forward, that such movements can only be accounted for by supposing birds to have minds more sensitive than ours, and that a flock moves by a common impulse akin to a mind-wave. Detailed observations have, however, been given to show that flock movements can be explained without calling in any special hypothesis.

The effects of social life on the intelligence of animals is next discussed, showing how, on the

whole, the social mammals and birds are of a higher mentality than the non-social species.

The chapter devoted to "Courtship and Mating" is perhaps not the least important, for it is not always realized that apart from the passionate desire that leads to pairing, many mammals and birds show long and steady attachments, an abiding love, which keeps the mated couples together for life and faithful to each other.

Fear, especially with regard to man, has been dealt with at length because fear is a special product of civilized man's contact with wild life and an example of selection and evolution at work on the mentalities of the creatures around us.

And lastly we come to this concluding chapter, in which I wish to point out that we have found experience with the higher creatures, as with us, to be the great factor in their lives, experience by which they learn and profit, and modify their conduct accordingly; so that we are justified in replying to the question mentioned in the preface to this book—namely, Do animals think, have they purpose?—with a plain "Yes." We have seen that though many creatures may be instinct-ridden, and perform actions of which they can have no knowledge of the outcome, this does not preclude them profiting by experience, and that in the higher vertebrates such instinctive behaviour drops into the background and becomes of but secondary importance.

The great difference between animal mind and human mind is memory, the extent to which the creature can memorize and learn. Our position on

this globe is simply and solely due to our terrific memories, so that we can combine our perceptions into conceptions, and combine our concepts in every possible way. I have elsewhere referred to our "overgrown" brain, and when we compare the human cerebrum with that of other species it is obvious that the word is apt. Compared with other brains, the human brain is like the antlers of the extinct Irish deer (*Cervus giganteus*), enormous and top-heavy, a terrific overdevelopment, as if the process of evolution having been started in that direction, could not pull up, but must go on developing and developing. The Irish deer, with its magnificent antlers nine feet or more across, perished, as have many other species which have sustained abnormal development in some one direction: abnormal development, whether as regards size, or appendages, has always brought the creature to nought; the monstrous beasts have all perished and the moderate ones survived. Now we come to man, with his monstrous brain, who has, in consequence, overrun the world, and is fast increasing to the limits of its capacity; but the question of the future of the human species does not concern us here—all we are striving to do is to gain some understanding of the animal mind by means of comparison with our own. We who remember so much, who recollect so much, who put these memories and experiences together, and look forward into the far future, for whom time stretches back long years and forward until imagination can imagine no longer—we ask, How far backwards and forwards

does the time stretch in which the animal lives? The child helps us to an answer. With the little child its joys and sorrows are like "April showers that pass with varying shadow o'er the grass," for it hardly looks beyond the present, it lives in the joy or woe of the moment, and it is the same with the animal—only more so!

All our observations, the closest watching of wild creatures, make us believe that even the most intelligent live more or less in the present. Here I must digress to say that these remarks are in no way meant to prejudice those on "purpose," for it has been amply demonstrated that the more "brainy" creatures consider beforehand what they will do, and that they may nurse a grudge for weeks; but, compared even with a small child, the average bird, and the average mammal, live in the immediate moment. Their fears, their alarms, their furies and their sorrows pass quickly, to give place to joy and contentment. The bird that has been robbed of its nest worries, so far as we can judge, but little once the deed has been done, but sets to work to make another nest. The finch that has dived, panic-stricken, into a bush at the passing of a hawk, picks itself out again as the shadow passes, and goes on about its business with no further sign of disturbance; for that which is past is done with.

This brings us to the question, Has the animal knowledge of death? With the possible exception of the highest apes, the answer, in my opinion, is No. What idea of death has a little child? None,

unless its elders teach it. Living as animals do, chiefly for the moment, with their comparatively limited memories, therefore limited experience, and no vocal language in which to convey abstract ideas, or receive concrete experience from their fellows—but of course animals *do* communicate, very clearly too, their desires and emotions to each other—it is obvious they have no chance of realizing their lives will terminate, and no anticipation of death.

Living thus for the minute, with little thought for the morrow, living exemplifiers of "sufficient unto the day is the evil thereof," these creatures, feathered and furred, are happy, and we have only to watch them to see that they are bubbling over with life and joy. The little voles in their tunnels between the grass stems, the song-thrush on the tree, the rabbits in the meadow, and the fox going his nightly rounds, are all happy in their little busy lives, for they worry not.

The popular conception of "Nature red in tooth and claw," and of the struggle for life, and of all creatures living a painful harrowed existence, in hourly fear of a gory death, is a grotesque travesty of the normal life of wild creatures. That the majority do die a violent death is indisputable, but it is equally indisputable that sickness and ill-health are almost unknown in Nature. Death, when it comes, comes quickly and unexpectedly : more often than not the creature is gone before it is aware that danger is at hand. The long-drawn-out, painful, lingering illness is unknown. A wounded bird is

generally put out of its suffering by hawk or owl, and a wounded mammal by some other predatory beast. Only the healthy, and therefore happy, survive. As remarked in the chapter on the "Mind of the Hunter," *wilful* cruelty is unknown in Nature: a creature, as a stoat hunting a rabbit, may inflict suffering on another because it has got to catch it, and incidentally catch a supper, but it does not hunt for the pleasure of causing pain; it hunts because it wants something to eat. Wilful cruelty is the prerogative of man.

In fact, we may conceive the wild animal leading a happy care-free existence, an existence which in most cases is but of the moment, and in which worry for the future has no part; an existence, however, which is full of thrills, of joys, loves and emotions, all very similar to ours, and differing only in degree.

In considering animal life, especially animal mind, the early Victorian conception of it as one thing, and we as another, should be rigorously excluded. The better we know ourselves, the better we shall understand the creatures about us, with which we have risen from a common origin, and with which, little as some of us like to think it, we still have so much in common. The Red Indian's conception of the animals as his "little brothers" is nearer the scientific idea of the universe than that of those who were wont to speak patronizingly of "poor dumb beasts" and the "lower animals."

As I have said, the Victorian attitude towards the animal kingdom has long gone: no thinking person

now fails to recognize that they and we are common products of a common cause, evolved together, similar in origin, differing but in degree; and the question which to a former generation would have seemed sheer blasphemy—Has the animal a soul?—seems to us only too natural a one.

Who knows the answer? All we can reply is, "What they have we have, what we have they have." We have mind, so have they, in varying degrees, from that of the dog, the otter, and the elephant, to the limited intelligence of a shrew and the glimmering consciousness of the lowest creatures. With all the marvels daily unfolding before us through the discoveries of Science, what are we, with intellects so puny, for all our boasting, to affirm that there is, or is not, survival of personality, human or animal?

We can only bow in awed silence before the wonder of the Universe, the whence and whither of which we know not. All we know is that all life is one.

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